MALCOLM PIRNIE

17 7 2 5 9

ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

960736

RI/FS WORK PLAN FOR:

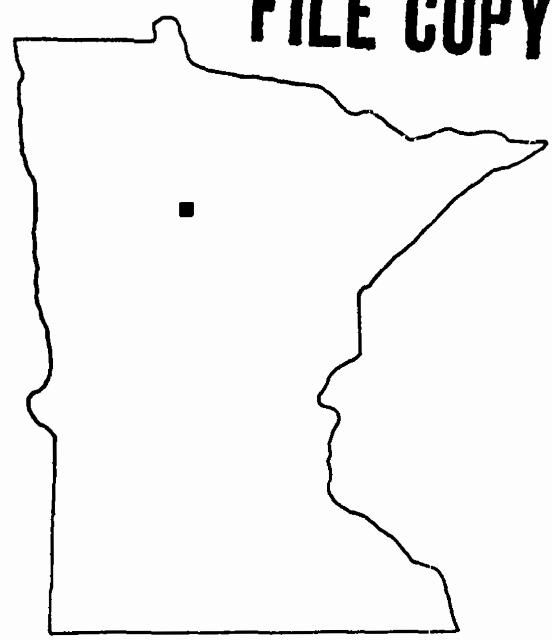
TECHNICAL SUPPORT SECTION DOCUMENT

RECEIVED
MAY 0 2 1986
Program Support Section

RECEIVED
APR 24 1986
MPCA, SOLID & HAZ. WASTE DIVISION

KUMMER SANITARY LANDFILL

FILE COPY



NORTHERN TOWNSHIP
BELTRAMI COUNTY, MINNESOTA

MINNESOTA POLLUTION CONTROL AGENCY

APRIL, 1986
671-03-1136

Kummer Sanitary Landfill

Remedial Investigation / Feasibility Study
Work Plan

TABLE OF CONTENTS

MALCOLM PIRNIE

FILE COPY

Page

Chapter 3 - Health & Safety Plan

Chapter 4 - Site Security Plan

Page

MALCOLM PIRNIE

List of Figures

List of Tables

List of Appendices

CHAPTER 1

EVALUATION REPORT

KUMMER SANITARY LANDFILL

NORTHERN TOWNSHIP, BELTRAMI COUNTY
MINNESOTA

APRIL, 1986

MALCOLM PIRNIE

1.0 EVALUATION REPORT

1.1 Existing Data Review

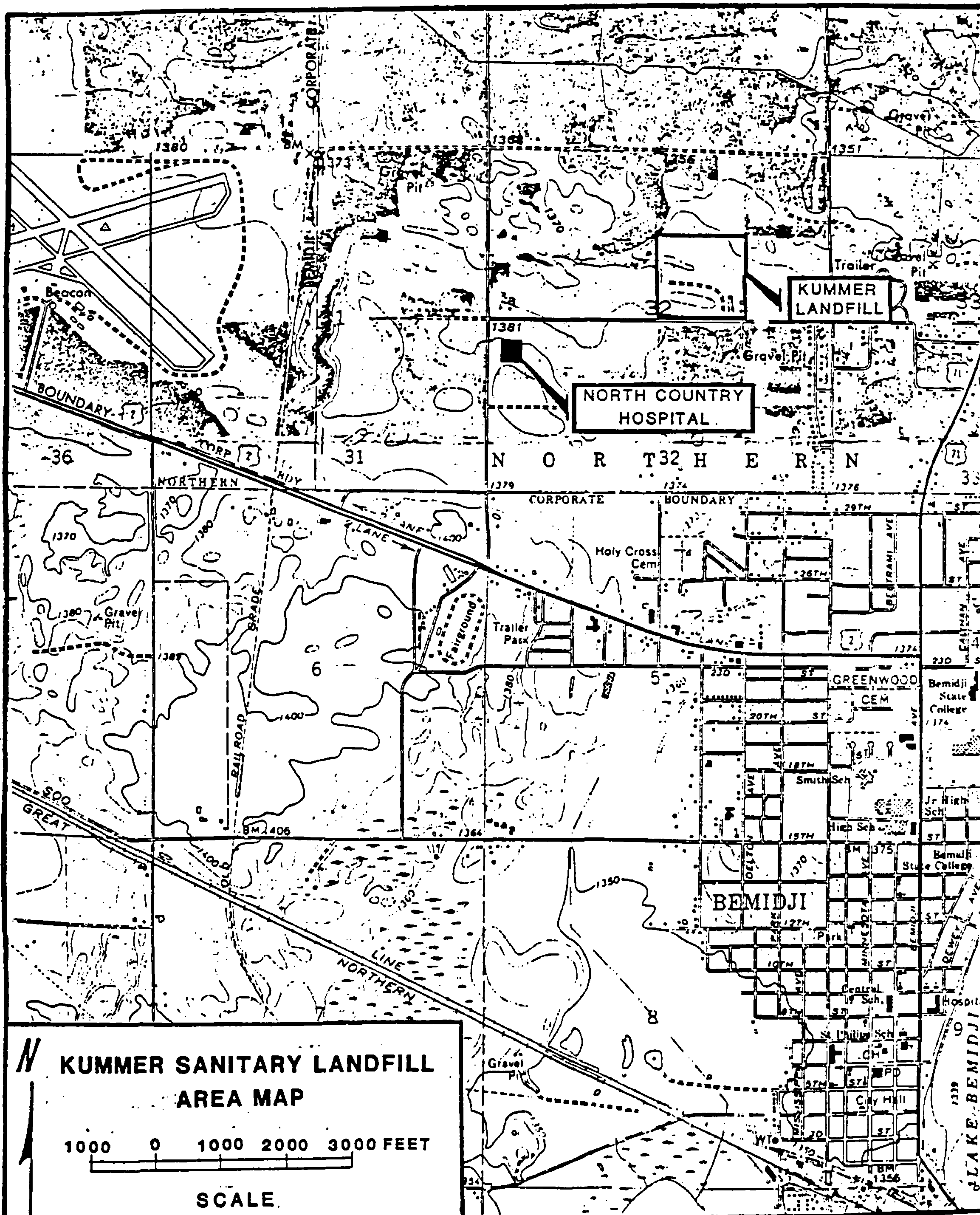
The Evaluation Report is based on a review of available data and information concerning the Kummer Sanitary Landfill. Information on regional physiography, geology, and surface and ground water hydrology, although dated, is sufficient for the purposes of the Remedial Investigation (RI). If additional data are found, they will be incorporated into the remedial investigation. Although a large ground water quality data base has been developed, some of the data, especially data based on samples of the landfill monitoring wells, is considered questionable. Appropriate quality control procedures and standards had not been established during the 1970's when much of the monitoring well data was obtained. For these reasons, the following discussion of site-specific conditions and the evaluation of water quality data are relatively general and qualitative.

Review of existing data includes a search of published material at the University of Minnesota libraries, the Minnesota Geological Survey (MGS) well log files and publication lists, the Minnesota Pollution Control Agency's (MPCA) Solid and Hazardous Waste Division files, the report files of the USGS offices and the files of Leggette, Brashears and Graham, Inc. In addition, information developed during the preliminary field reconnaissance including interviews with Mr. & Mrs. Charles Kummer, owners of the landfill, of the site and surrounding environs, meetings with MPCA personnel (Messrs. Larry Olson and Bruce Nelson), and correspondence with Mr. R. E. Rolling of the Beltrami County Soil Survey is included. A list of maps, technical reports and personal communications which were used in preparation of the Evaluation Report is included at the end of this chapter under "Selected References."

1.1.1 Regional Physiography

The Kummer Sanitary Landfill is located in Northern Township in South-Central Beltrami County. Figure 1-1 provides a regional map for the Kummer site. This area is characterized by flat to gently rolling terrain to the north and gently rolling terrain to the south. Surface elevations range from approximately 1,050 to 1,550 feet above mean sea level.

FIGURE 1-1



KUMMER SANITARY LANDFILL
AREA MAP
1000 0 1000 2000 3000 FEET
SCALE
KUMMER LANDFILL
NORTH COUNTRY HOSPITAL
BEMIDJI
NORTHERN CORPORATE BOUNDARY
Holy Cross Cem
Fairground
Trailer Park
GREENWOOD CEM
Bemidji State College
Smith Sch
Jr High Sch
High Sch
Central Sch
St Philips Sch
Hospit.
City Hall
Gravel Pit
Beacon
SOO LINE
GREAT NORTHERN
RAILROAD GRADE
LAKE BEMIDJI

Numerous wetlands and lakes are found in the area. Prior to agricultural drainage, one-half of Beltrami County was composed of wetland. Many present bogs and peat deposits indicate the wetland history of the area (Todd, 1899). Regional drainage is to the south. Lake Bemidji drains east to Cass Lake which drains to the Mississippi River. The site lies within the headwaters of the Mississippi River.

Black, red, and white pine forests (with lesser deciduous stands containing poplar, aspen, basswood, elm, birch and maple) covered the county prior to agricultural settlement and lumbering. Today, much of the woodland is planted pine with some reforestation by aspen, birch, spruce and white pine (Todd, 1899). Mineral resources of the county consist primarily of aggregate (sand and gravel) and peat. Sand and gravel borrow pits are common in the vicinity of the site.

1.1.2 Site Location and Local Physiography

The Kummer Sanitary Landfill is located in Section 32, Township 147 North, Range 33 West, Northern Township Section 32, (NE 1/4, SW 1/4), Beltrami County. The site is approximately one mile west of Lake Bemidji along the north side of Anne Street, N.W., midway between Highways U.S. 71 and MN. 15. The northern limits of the City of Bemidji are one block south of the site.

The landfill property is over 40 acres in size. The site is bound on the east and west by pasture and grain cropland, on the north by woodlands and a bog, and on the south by planted pine woods and a gravel pit. Approximately 30 to 35 acres of the landfill have been landfilled. The extreme northern portion of the site has been the source of borrowed material for daily landfill cover. To the north and west of the site the land is sparsely settled with farm residences and other isolated buildings. The closest residential building is the Kummer residence located on-site in the extreme southeast corner of the property. A large residential community lies approximately 1,000 feet farther to the east and south. This area includes the Hillcrest Manor Mobil Home Park, Anne Street, Cedar Lane, Irvine Avenue, Minnesota Avenue, Tamarack Avenue, Bemidji Avenue, and several smaller streets. No buildings are located within 3,000 feet directly south of the landfill. North Country Hospital is located directly southwest of the site at the corner of Pine Ridge Avenue and Anne Street. The Sandy Hills Acres subdivision borders the western edge of the landfill property. Greenleaf Avenue of this subdivision lies within 500 feet of the landfill. Presently only one home has been built in Sandy Acres, although unimproved roadways have been constructed. The single home is at the southeast corner of Greenleaf Avenue and Anne Street along the western side of the landfill.

The terrain is very gently rolling. Surface elevation at the site ranges from about 1,360 to 1,380 feet above MSL (see Plate 1). Local surface drainage is generally northward. Approximately one-half mile to the north a modified stream channel or ditch carries runoff eastward to Lake Bemidji.

1.1.3 Regional Geology

1.1.3.1 Bedrock

Bedrock is Precambrian Era in age and is described by Sims (1970) as igneous felsic intermediate intrusive rocks. The rock types "are largely inferred from gravity and aeromagnetic data; age uncertain, in areas south of Lake of the Woods, includes some gneisses" (Sims, 1970). Regional NW-SE trending fault traces are present a few miles to the north and west of Bemidji. According to the Bedrock Hydrogeology map of Minnesota by Kanivetsky (1978), these faults do not extend beneath the site.

The Bedrock Topography Map of Minnesota (Olsen and Mossler, 1982) is incomplete in this region. A few drill hole bedrock depths and outcrops were available for central Beltrami County and central Hubbard County. A drill hole about 10 miles northeast of the landfill site encountered bedrock (bedrock type not indicated) at a depth of about 530 feet below the surface. Other bedrock elevations about 25 miles north of the site range from about 250 to 350 feet below the surface (based on data from five drill holes). Two drill holes approximately 20 miles south of the site in Hubbard County indicate bedrock depths of 200 to 400 feet below the surface (these two holes were only three miles apart).

1.1.3.2 Unconsolidated Deposits

The unconsolidated sediments in this area consist of clays, silts, sands, and gravels deposited during the Late Wisconsin Glacial Period. The glacial deposits of Beltrami and Hubbard Counties consist of undifferentiated outwash of the Des Moines Lobe (Late Wisconsin Age) and older ground and end moraines of the Wadena Lobe of Early to Late Wisconsin Age (Hobbs and Goebel, 1982).

These deposits are highly variable, as indicated in the following citation from Oakes and Bidwell (1968):

> "Glacial Deposits in the watershed include till, lenses of sand and gravel in till, outwash deposits of sand and gravel, and lake deposits of fine sand, silt and clay."

1.1.4 Regional Hydrology and Hydrogeology

The Kummer Sanitary Landfill is located in the Mississippi River Headwaters Watershed. Water resources in the area are considered abundant with lakes and streams occupying about 8 percent of the regional surface area. Ground water supplies are available from the glacial drift. In some areas domestic water supplies may be obtained from the bedrock (Oakes and Bidwell, 1968). The Mississippi River, many of its tributaries, reservoirs and numerous lakes provide water suitable in quantity and quality for most industrial, municipal, agricultural, and recreational uses. Stream flow is fairly regular because of storage in lakes, swamps, and glacial deposits. Average annual runoff from the watershed is about 5.34 inches. Lake surface evaporation is about 1.8 cubic feet per second per square mile

The ground water reservoir contains the largest quantity of water available within the area. Ground water discharge provides at least part of the base flow of streams and uniform lake stages. Ground water yields of up to 500 gpm are available from outwash deposits, providing sufficient amounts for many municipal, industrial, and agricultural needs. Outwash deposits underlying present surface water courses provide the best source of ground water supply. Some ground water is also available from buried valleys filled with glacial deposits and from Precambrian sedimentary rock. Saturated thickness of glacial deposits range from 50 to 500 feet (Oakes and Bidwell, 1968).

Ground water quality is typically represented by hardness values from 68 mg/l to 200 mg/l. The sum of iron and manganese concentrations range from 0.02 to 7.80 mg/l. The ground water quality makes this resource suitable for irrigation purposes (Oakes and Bidwell, 1968).

Climate in this region is temperate. The National Oceanic and Atmospheric Administration compiled climatic data from the Bemidji Airport (one and one-half miles west of the site) for the period 1941 to 1970 (Hult, 1984). These data indicate an annual temperature range of -16 C (-3.2 F) in January to 20 C (68 F) in July. Precipiation is moderate, 22.25 inches annually with 10.5 inches of this amount occurring as rain in June, July, and August. During the period November through March, 3.2 inches fall as snow. Most of this moisture is held in storage as snow until the spring thaw allowing recharge of the ground water table as well as runoff to surface water bodies. The report by Oakes and Bidwell (1968) states that annual precipitation in this region is 25.33 inches. This value includes 5.34 inches of surface runoff, 0.01 inch of ground water underflow, an estimated storage of 0, and 19.98 inches of evapotranspiration. The precipitation value provided by Hult is probably more accurate for this site. The information from Oakes & Bidwell is included because it is the only source of information found for runoff, underflow, and evapotranspiration.

Ground water use in the Bemidji area is limited to the unconsolidated deposits above bedrock. The bedrock formations are not considered to yield water in sufficient quantities for municipal, agricultural or industrial use. Some ground water, sufficient for domestic purposes, may be available from the weathered upper surface of the Precambrian bedrock and from faults and fractures (Kanivetsky, 1978). The City of Bemidji supply wells located one-half mile south of the site are 83 to 208 feet in depth (Oakes and Bidwell, 1968) and are completed in the drift.

1.1.5 Site Specific Geology

1.1.5.1 Unconsolidated Deposits

Limited site specific information on the geology was found in the MPCA and MGS files. Review of available published literature indicates that the site is underlain by glacial outwash [deposits of sand and gravel mixed with some silt and clay, and with interbedded layers of sand and gravel laid down by glacial melt water streams (Kanivetsky, 1979)].

Samples of the cover material and subsurface deposits were examined at the site during the preliminary field reconnaissance. Portions of the cover material in the west-central area of the fill contain some clay (amount not determined). The remaining landfill cover material is derived from the sand and gravel glacial outwash found on-site and is, therefore, very permeable. Examination of hand samples of the glacial outwash from the bottom and sides of borrow trenches used for cover material along the northern edge of the landfill shows a medium size brown to reddish brown sand with 10 to 30 percent medium size to coarse size gravel. Individual sand and gravel grains are mostly white or clear quartz with some brown and/or red feldspar grains giving the soils an overall color of medium to reddish brown. Shallow hand auger borings performed at the site indicate fine sand to the water table, a depth of approximately 20 feet below ground level (Sunde, 1980).

Well logs for domestic wells located within two or three miles of the site indicate the top of a clay layer at a depth of 36 to 45 feet below ground level. The thickness of this layer is uncertain; however, it appears to range from 1 to 60 feet. Sunde (1980) reports that borings were performed during construction of the North Country Hospital located one quarter mile southwest of the site. These borings, which extend to maximum depths of 42 feet, show medium to fine grained sands with a little gravel throughout the boring depth except in a thin layer of silty clay at about 30 feet. Soil conditions at the hospital borings should be reasonably comparable to those at the landfill site due to their proximity, similar topography, surface soil types, and mechanics of deposition.

1.1.5.2 Bedrock

As stated above in Section 1.1.3.1 depth to bedrock in the region is not well known. Information regarding bedrock depths in the vicinity of the site could not be located. The City of Bemidji Municipal Well 11 is located approximately one mile southeast of the site near Birch Lane in Bemidji. Its well log indicates unconsolidated deposits (mostly glacial) to the bottom of the drill hole at 430 feet. From this well log and the information on the Bedrock Topography map (Olsen and Mossler, 1982) it is reasonable to assume that bedrock depth is between 430 and 530 feet below the surface. Since the bedrock formations are deep and since they are not considered an important source of ground water in this region, the possible impact of the landfill upon bedrock ground water quality will not be investigated further.

1.1.5.3 Well Inventory and Inspection

During the Existing Data Review well logs obtained from the Minnesota Geological Survey were reviewed for information concerning the geology of the site vicinity. Locations of several critical well logs could not be adequately determined from the information presented on the well log forms. The location of wells is essential in properly evaluating subsurface soil conditions. Such information may eliminate the need for additional off-site monitoring wells. Well log information is also useful in the evaluation of the water quality data obtained from private wells. Very few of the private wells sampled could be matched with well logs in the MPCA and MGS files. Therefore, the Project Team recommends that these well logs be located by field inspection or by interviews with homeowners, if necessary.

1.1.6 Site Specific Ground Water Conditions

Based on Sunde's 1980 report, ground water flow is toward the northeast and east at a very shallow gradient. Ground water gradients will be confirmed during the RI. The large bog north of the site acts to control ground water levels along the northern part of the site (Sunde, 1980).

During the preliminary site reconnaissance Mr. Kummer noted that, at about 35 feet below the original ground surface, a 6-foot clay layer separates the upper water table aquifer from a lower aquifer which may be confined. As indicated by Mr. Kummer, the well at his residence is about 60 feet in depth. The monitoring wells described further in Section 1.2 are each about 21 feet deep. The screen at the bottom of these wells was set at the first contact with water (Sunde, 1980, Kummer, 1985). They are all 1-1/2-inch diameter sand (or drive) points. A heat pump well, 117 feet deep, screened from 112 to 117 feet below ground level at the Channel 26 TV Station offices, located 1,000 feet east of the Kummer residence, yields 5 to 10 gallons per minute (gpm).

As mentioned above, ground water flow is toward the northeast and east. However, the water table elevation contours on an engineering drawing provided by MPCA, indicate flow to the southeast. This information is based on monitoring wells, some of which are known to be of poor construction. Therefore, ground water gradients must be confirmed with new monitoring wells proposed for the RI.

1.1.7 Site-Specific Soils

The soils at this site are loamy sands of the Menahga-Graycalm soil association (Beltrami Co. Soil Survey, correspondence, 1985). Slopes range from 0 to 6 percent. These soils have high permeability 6 to 20 inches per hour and are considered by this writer to be unsuitable as landfill cover or liner material.

1.1.8 Evaluation of the Landfill Site in Terms of Known Geologic Conditions

The wastes disposed of at the Kummer Sanitary Landfill were buried in glacial deposits that are predominantly sand and gravel. These types of geologic materials contain relatively little fine material such as silt and clay which is necessary to absorb contaminants found in typical landfill leachate. They are also very permeable and allow leachate to migrate through the sides and bottom of the landfill.

These same deposits were also used as the cover material. Since these materials are permeable, they allow penetration of rainfall and runoff through the cover into the waste. Once in contact with the waste, leachate is generated as the rainfall or runoff water dissolves soluble portions of the waste material. The water may also transport some of the waste as suspended particles.

It is believed there is no artificial liner beneath the landfill (Olson, 1985). Local water-well logs indicate the top of a clay layer at 36 to 45 feet beneath the ground surface. Other well logs indicate sand and gravel to depths of 60 feet or more. It is not known whether this clay layer exists beneath the landfill, or, if it does, whether or not it may have been breached by landfill operations. Site inspections by Mr. Olson state that the ground water table was only inches below a trench excavation on the north side of the landfill.

Because of the permeability of the geologic materials, the Kummer site is not considered suitable for a landfill. An artificial liner and a clay cap may have reduced the potential for leachate production in the landfill as well as migration from the landfill. A clay cap would be a desirable and practical minimum remedial effort for this site. The clay cap would reduce leachate production which is evidently still occurring within the landfill.

A properly designed clay cap would also reduce the differential settlement problem on the surface of the landfill. Improperly compacted waste in the landfill continued to settle after closure of the landfill. This caused depressions on the surface of the landfill (observed during the preliminary reconnaissance) where runoff collects and enters the landfill through the permeable cover. As water percolates through the waste it may wash out some of the finer waste particles and some of the soils which may have been used as daily or intermediate cover. The removal of these particles of waste and soil will further aggravate the surface settlement. As settlement occurs, tension cracks may form in the cover material. This increases the permeability of the surface cover and therefore increases leachate production and further aggravates the wash out of waste and soils.

1.2 Existing-Ground Water Monitoring Wells Review

Three monitoring wells were installed on the landfill property in the summer of 1971. These were identified as Well 1, also known as (AKA) the Kummer Well, or the house well; Well 2, renamed Well H by Mr. Sunde in 1980; and Well 3, also renamed Well F by Mr. Sunde. In 1980, Wells A through I were installed with Well J added just after. All of the monitoring wells associated with this landfill were installed by Mr. Kummer. Plate 1 shows the locations of the on-site monitoring wells except for Well J, the location of which is unknown. No well logs or field notes were kept during installation of these monitoring wells. Elevations for the wells was not surveyed to mean sea level or an arbitrary datum. Information in the files of MPCA (Jakes, 1982, Olson, 1972-1985) indicates that proper maintenance of the wells was not performed. This may have led to contamination of the ground water via open annular spaces or vandalism. The MPCA files (Jakes, 1982) indicate apparent confusion over the labeling of the monitoring wells during many of the sampling surveys. Knowledge of the depth, screen setting, measuring-point elevations, and general integrity of a monitoring well is critical in evaluating ground water flow direction and aquifer characteristics. This information must be available in the form of well logs or field notes made during installation. Without this information as a basis, field inspection of the wells would be of little additional value. There is only limited information on the depths and elevations of the monitoring wells. It was, therefore, decided that these existing on-site wells will not be included for use during RI activities except for water level monitoring and then only after they have been determined still fit for this use.

If upon further inspection during the RI, the existing monitoring wells are determined to be a possible hazard to ground water quality, then the

Project Team will remove and seal the wells according to Minnesota Department of Health Code. Those wells which are not removed will be properly secured with locking caps and guard posts.

1.3 Ground-Water Quality Review

1.3.1 Sampling History

The files of the MPCA contain over 200 reports of analyses of samples from ten Kummer Landfill monitoring wells and over 70 residential and commercial wells; although data for only 64 wells was found in the MPCA files. Well 1, the Kummer House Well at 901 Anne Street, has been sampled at least twice per year between 1971 and 1982 except in 1981 when it was sampled once. This is considered to be a downgradient well. Well 2 (AKA Well H), which is the original upgradient well, was also sampled whenever the house well was sampled. Well 3 (AKA Well F), also considered a downgradient well, was sampled intermittently during this same period. The remaining monitoring wells A, B, C, E, F, G, and I, which is an upgradient well, were installed in 1980, and were sampled several times in 1982 and 1983. Well D, which existed in 1980, was confused with the house well on one occasion. Well D was apparently never sampled. Well D may be a utility well in the shop building located to the west of the Kummer residence and near the roadway into the landfill. All of the monitoring wells and over 70 residential or commercial wells were sampled at least once for 54 organic parameters. From 1971 to 1978 the three original monitoring wells, Well 1 (Kummer House Well), Well 2 (Well H), and Well 3 (Well F) were sampled by Mr. Charles Kummer and analyzed by SERCO Laboratories (1971 to 1973) and Minnesota Valley Testing Laboratories (approximately 1974 to 1978). From 1978 through 1983 the samples were collected and analyzed by either Bemidji State University (1979 to 1982) or the Minnesota Department of Health (1978-1979, 1982-1985). A number of inorganic and organic analyses were performed on residential and commercial wells in the vicinity of the landfill from 1982 through 1985. These samples were collected by representatives of the MPCA and were analyzed by the MDH. Chain-of-custody forms and field blanks were available for most of these data.

An MPCA internal memo from Mr. Donald Jakes, Hydrologist, included in Appendix A-1 of Chapter 1, details a number of problems associated with the water quality data. Although there is considerable water quality data available from the landfill monitoring wells, the lack of sampling consistency and quality control for the sampling surveys conducted prior to 1978 (prior to sample collection by laboratory or MPCA personnel) severely limit the reliability of the water quality data. Even after quality control measures were instituted, the poor condition and lack of maintenance of the monitoring wells leaves considerable doubt about the more recent data collected by the MPCA and analyzed by the MDH laboratories. It is important to develop an historical perspective on ground water quality trends and the geochemistry of the ground water. Since the monitoring wells provide the only historical ground water quality data at or near the site, the evaluation of ground water quality discussion below includes data from selected monitoring wells. Therefore, the discussions must be considered qualitative and general.

1.3.2 Inorganic Water Quality

Inorganic water quality data are presented in Table 1-1 (water quality parameters, metals and phenols). The only water quality data from a shallow water-bearing formation prior to the installation of the landfill are from the three original monitoring wells installed at the landfill. Data for only three parameters -- chloride, pH and nitrate-nitrite as nitrogen (hereinafter referred to as nitrate) -- were obtained from these early analyses. Chloride concentrations were 2 to 3 milligrams/liter. The values for pH ranged from 6.8 to 7.2 pH units. Nitrate concentration was 0 mg/l (detection level unknown) in all three wells. Tables of inorganic water quality data prepared by the MPCA are included in the table attached to Mr. Jake's memo (Appendix A-1).

The remaining discussion concerning background water quality in the shallow zone is limited to Well 2 (Well H upgradient). Concentrations of chloride in Well 2 (Well H) increased from a range of 2 to 3 mg/l to a range of 10 to 13 mg/l in the mid-1970's. From 1974 to 1984, chloride concentrations varied from sample to sample, declining to 0.60 mg/l in the latest sampling. The increase in chloride concentrations in this well, which is considered upgradient of the landfill, may be due to the common use of road deicing salt which may affect shallow ground water, or it may be an effect caused by the landfill. Proposed upgradient wells (see Chapter 6) will be

TABLE 1-1

WATER QUALITY PARAMETERS

Well Identification	Hillcrest MHC*	Hillcrest MHC*	Hillcrest MHC*	Hillcrest MHC*	TV Station
Sample Collection Date	11/6/80	11/1/81	11/1/82	1/4/83	1/12/82
pH	6.8	7.8	7.7	7.8	7.1
Specific Conductivity	350.	350.	380.	370.	380.
M-O Alkalinity					200.
Alkalinity, Total		200.	200.	210.	
Hardness, Total	200.	198.	195.	189.	190.
Residue , Total	410.	230.0	220.	220.	
Residue, Total FLT (Diss.)					180.
Sulfate	<5.0	<5.00	<5.0	<5.00	<5.0
COD	25.	<5.0	6.3	<5.0	6.0
Carbon, TOC	2.30	4.70	2.10	1.90	<1.0
Nitrogen, TKN	0.25	0.430	0.30	0.500	0.42
Nitrogen, Ammonia	0.21	0.22	0.24	0.22	0.16
Nitrate					<0.01
Organic Nitrogen	<1.00	0.21	0.10	0.28	
Nitrate + Nitrite	<0.40	<0.40	<0.40	<0.400	
Phosphorus, Total	0.06	0.074	0.151	0.107	0.050
Chloride		<0.50	<0.50	<0.50	<0.5
Fluoride	0.12				
Calcium, Total	140.	140.	135.	130.	130.
Magnesium, Total	60.	58.	60.	59.	55.
Potassium, Total	1.3	1.20	1.47	1.34	1.5
Sodium, Total	2.82	2.79	2.61	2.75	2.6
Aluminum, Total					0.008
Arsenic, Total	<0.005	<0.005	0.0056	<0.005	
Cadmium, Total	<0.001	<0.001	<0.001	<0.001	
Chromium, Total	<0.005	<0.005	<0.005	<0.005	
Copper, Total	<0.050	<0.050	<0.050	0.095	
Iron, Total	0.64	0.860	1.80	0.600	0.340
Lead, Total	<0.010	<0.010	<0.010	<0.010	
Manganese, Total	0.23	0.230	0.210	0.220	0.230
Nickel, Total	<0.050	<0.050	<0.050	<0.050	
Zinc, Total	0.077	<0.010	0.012	0.027	

*Mobile Home Court
Concentration units are mg/l

MALCOLM PIRNIE

TABLE 1-1

WATER QUALITY PARAMETERS
(Continued)

Well Identification	Sovde	Westrum	Axvig	Pierce
Sample Collection Date	5/24/84	5/24/84	5/24/84	5/24/84
pH	7.4	7.6	7.6	7.8
Specific Conductivity				
M-O Alkalinity	260.	260.	230.	240.
Alkalinity, Total				
Hardness, Total	280.	260.	280.	260.
Residue, Total Suspended Solids	0.56	<0.5	<0.5	<0.5
Residue, Total FLT (Diss.)	310.	320.	370.	330.
Sulfate	19.	12.	17.	10.
COD	<5.	<5.	<5.	<5.
Carbon, TOC				
Nitrogen, TKN				
Nitrogen, Ammonia	<0.02	<0.02	<0.02	<0.02
Organic Nitrogen				
Nitrate + Nitrite	9.1	2.7	13.	1.3
Phosphorus, Total				
Chloride	210.	6.3	14.	25.
Fluoride				
Calcium, Total	210.	190.	210.	180.
Magnesium, Total	70.	74.	74.	77.
Potassium, Total	3.5	0.8	1.3	0.7
Sodium, Total	150.	3.5	12.	4.1
Arsenic, Total	0.0050	<0.0010	0.0020	<0.0010
Cadmium, Total	0.023	0.013	0.018	0.057
Chromium, Total	0.0005	<0.0005	<0.0005	<0.0005
Copper, Total	0.0091	0.011	0.016	0.0085
Iron, Total	<0.020	<0.020	0.020	<0.020
Lead, Total	0.0005	0.0004	0.0003	0.0012
Manganese, Total	0.005	0.003	0.003	<0.003
Mercury, Total	<0.00010	<0.00010	<0.00010	<0.00010
Nickel, Total				
Zinc, Total	0.0097	0.036	0.013	0.130

Concentration units are mg/l

MALCOLM PIRNIE

TABLE 1-1

WATER QUALITY PARAMETERS
(Continued)

Well Identification	Well H	Well H	Well H	Well H	Well I	Well I
Sample Collection Date	6/20/78	6/10/78	1/11/82	5/4/82	1/11/82	5/4/82
ph	7.3	7.6	7.2	7.08	7.2	6.8
Specific Conductivity	340.	380.	320.	330.	440.	380.
Turbidity			1.0		1.3	
M-O Alkalinity			180.		240.	
Bicarb Alkalinity			180.		240.	
Alkalinity, Total						
Hardness, Total	170.	201.	170.	160.	280.	220.
Residue , Total	180.					
Suspended Solids	0.8			1.2	76.	
Residue, Total FLT (Diss.)	180.		210.	190.	140.	210.
Sulfate	5.0		6.3		<5.0	
COD	<5.	6.	20.		11.	
Carbon, TOC	1.8	1.7	6.1		1.2	
Nitrogen, TKN			0.18	0.10	0.21	0.30
Nitrogen, Ammonia		<0.09	<0.02	<0.02	<0.02	<0.02
Organic Nitrogen						
Nitrate + Nitrite	0.46	0.44				
Nitrite	0.01		<0.01		<0.01	
Phosphorus, Total	0.026		0.080	0.032	0.170	0.152
Chloride	0.50	0.61	<0.50	<0.50	<0.5	0.77
Fluoride						
Calcium, Total	120.		120.	110.	200.	160.
Magnesium, Total	50.		48.	47.	78.	60.
Potassium, Total	0.57		0.5		0.7	
Sodium, Total	1.8		1.5		1.6	
Aluminum, Total					0.460	
Arsenic, Total	0.0012					
Cadmium, Total	0.010	<0.010		<0.010		<0.010
Chromium, Total	0.00077					
Copper, Total	<0.050	<0.050				
Iron, Total	0.200		0.480	0.190	5.500	4.50
Lead, Total	<0.050			<0.050		<0.050
Manganese, Total	<0.020		<0.020	<0.020	0.350	0.190
Nickel, Total	<0.050	<0.050				
Zinc, Total	0.140	0.160		0.150		1.900

MALCOLM PIRNIE

located farther upgradient from the landfill to avoid possible effects of ground water mounding (ground-water gradient reversal) beneath the landfill. Values for pH were not evaluated because it is not known whether field or laboratory pH values were reported for much of the data. Low pH values (6.8 to 7.4) are probably field values while higher pH values (7.5 to 8.0) are probably laboratory values for pH. The value of pH increases as the water sample is exposed to air and as changes in the sample occur after collection. These changes generally increase the pH. Therefore, the lab pH is not considered as representative of the pH of the ground water.

Nitrate concentrations are difficult to evaluate because sample values that were less than 1 mg/l were rounded to zero or 1 mg/l for the data tabulated prior to 1976. From 1976 through 1983, nitrate concentrations fluctuated, showing no overall trend.

Chemical oxygen demand (COD) analyses were performed on the samples from Well 2 during the period 1974 through 1983. In the mid-1970's COD values exceeded 10 mg/l. These concentrations coincide with many of the high chloride values and may indicate a contamination effect from the landfill. No upgradient source of COD is known. Concentrations of COD dropped below detection levels (5 mg/l) in the late 1970's, reappeared at high concentrations of 20 and 14 mg/l in two samples in 1982 and then dropped below the detection level again in the last sample collected in 1983. COD values above 10 mg/l may indicate ground water contamination. If true, it is conceivable that either the landfill is contaminating this upgradient well via a ground water gradient reversal or surface leachate seepage along the outside of the casing (although this has not been observed), or there is an upgradient source of contamination.

Chloride data appear to be fairly consistent. However, there is less confidence in the pH, nitrate, and COD data, especially for analyses of those samples collected by Mr. Kummer or other nonlaboratory or MPCA personnel prior to 1978.

Although Well 1 (Kummer House Well) is considered a downgradient monitoring well, it has shown no substantial increase in chloride concentrations during the period 1971 to 1983. Average chloride concentration increased from 2 or 3 mg/l in the early 1970's to about 6 mg/l in the last two sample surveys. This increase could be due to road deicing salt which has increased chloride and sodium concentrations in ground water in many areas of the U.S. As with upgradient Well 1, COD concentrations increased in the mid-1970's, declining in the late 1970's and early 1980's. The last sample, collected in 1983, showed an increase to 9.8 mg/l.

Specific conductivity (SC) concentrations in Well 1 (Kummer House Well) have shown a fairly steady rise from about 250 or 300 micromhos/cm in the early 1970's to 620 micromhos/cm in the last sample in 1983. At the same time, though, nitrate concentrations have shown a decrease in recent years.

In contrast to Well 1, Well 3 (Well F, downgradient) shows very significant increases in chloride, specific conductance and COD. However, in 1982 and 1983, chloride and SC concentrations began to decline. Nitrate data show an increase in the most recent samples collected in 1982 and 1983. Values for pH appear to have declined in the late 1970's, but this may be due to a change in procedure from reporting lab pH to reporting field pH.

Well B is located about 600 feet downgradient, or east, of the landfill. It is assumed to be about 20 feet deep as are the on-site monitoring wells. Specific conductivity ranges from 470 to 500 micromhos/cm and chloride ranges from 3.3 to 4.3 mg/l in the most recent three samples. These values are slightly higher than those for Well A (assumed depth similar to Well B) which is about 1,200 feet downgradient from the site (chloride, 1.2 to 1.9 mg/l; SC 390 to 430 micromhos/cm). These data may indicate a slight effect from the landfill on Well B. Other inorganic parameters measured for these two wells show no indication of contamination effects.

Inorganic water quality data for the other on-site monitoring wells are not discussed in detail due to the limited data base and because of confusion over monitoring well and sample identification. The sampling record for these monitoring wells is too brief to establish confidence in the water quality data. In qualitative terms, Wells C, E, and J, show evidence of contamination, based on chloride, specific conductance hardness, and COD concentrations. Well G, north of the landfill, is considered upgradient and shows no evidence of contamination except for COD (26 and 36.5 mg/l). The high COD values may result an effect from a swamp or bog which is located near this well.

Inorganic water quality analyses were performed on four shallow residential wells downgradient of the landfill. These are labeled as Sovde, Westrum, Axvig, and Pierce on Table 1-1 and Plate 2. Data from these shallow wells was compared to data from upgradient Wells H and I (see Table 1-1). Evaluation of the effects of the landfill on these four residential wells is difficult because both Wells H and I may also be affected by the landfill even though they are upgradient. Calcium and magnesium concentrations in each of these residential wells were higher than the concentrations for these parameters in Well H (for both the January and May 1982 samples of Well H). However, the concentrations of calcium and magnesium concentrations in the residential wells were higher for the May sample from Well I but not for the January sample. Chloride and sodium concentrations were higher in the four residential wells than in Wells H or I. Chloride concentrations highest in the Sovde well including the Pierce well which is much closer to the landfill. Chloride and sodium concentrations in the Sovde well may be due to some other factor such as a septic system, disposal of water softener wastewater, or road deicing salt.

It should be noted that the concentrations of iron in the four residential wells were all below detection levels, while significant concentrations of cadmium were found in each of the four wells. Virtually all of the other well data reviewed with regard to this site have shown the presence of iron in moderately high concentrations while cadmium was rarely detected possibly indicating laboratory error during the analysis of the samples from these four wells. Four shallow wells were identified which had been sampled for both organic and inorganic contaminants. These wells (Sovde, Westrum, Axvig, and Pierce) were discussed above in Section 1.3.2. Although each of these wells show evidence of organic contamination, the evidence for the presence of inorganic contaminants is much less pronounced. This is especially true of the Pierce well which is a few hundred feet southeast of the landfill. The Pierce well showed significant levels of organic compounds while only slightly elevated levels of inorganic contaminants. This apparent contradiction in the data should be investigated further to validate the water quality data and/or to investigate routes of migration for the various types of contaminants.

Concentrations of contaminants such as calcium, magnesium, chloride, and sodium found in typical landfill leachate and found in high concentrations in downgradient monitoring Wells C and F were only slightly higher in these four private wells (ignoring the data for chloride and sodium in the Sovde well) than in upgradient Wells H and I. Concentrations of COD were actually lower in the four residential wells than in Wells H and I. The elevated levels of calcium, magnesium, chloride and sodium could be explained by nearby residential sources of these contaminants. These may include septic tanks, water softener wastewater, and road deicing salt.

Available data for the deep wells of the television station (117 feet deep) and Hillcrest Manor (assumed to be over 100 feet deep), show no conclusive evidence of contamination. Elevated phosphorus levels (greater than 0.020 mg/l) were noted but they appear in both upgradient shallow and downgradient shallow and deep wells.

1.3.3 Organic Water Quality Data

Organic water quality data are presented in Table 1-2. Upgradient data available for monitoring Well H, and the maintenance well at the North Country Hospital is tabulated in Table 1-2. None of the organic parameters tested in samples of ground water from Wells H or I were found above or near the detection levels of the laboratory equipment utilized by the MDH laboratory. The sample from the hospital maintenance well contained bromodichloromethane (0.7 ug/l) and chloroform (2.4 ug/l).

Twenty-five halogenated and nonhalogenated compounds (including those discussed in the previous paragraph) were detected in downgradient monitoring wells and private wells. These parameters are identified in Task 5 of the Potential Responsible Party Search and are listed in Table 1-3. Concentrations for these parameters in the downgradient monitoring wells range from barely detectable levels to 130 ug/l (tetrahydrofuran). The highest concentration for an organic compound found in a private well was 46 ug/l (methylene chloride). Most of the organic compounds were at concentrations less than 10 ug/g.

A list of the private wells (residential and commercial) sampled is included as Appendix A-2. Based on data collected through 1984, most of the contaminated private wells are located in a three block area east of the

TABLE 1-2

Organic Water Quality

For Selected Residential Wells

VOLATILES

RESIDENT WELL OWNER:	Field Blank	[redacted]							
DATE SAMPLED:	1/10/85	4/23/85	4/23/85	7/25/84	4/23/85	4/23/85	10/9/84	10/12/84	4/23/84
DATE ANALYZED:	1/15	5/6	5/6	7/30	5/7	5/7	4/23	5/8	5/8
Non-Halogenated Compounds									
Acetone									
Ethyl Ether									
Benzene									
Toluene									
Cumene									
M-Xylene									
Tetrahydrofuran									
Methyl Ethyl Ketone									
Methyl Isobutyl Ketone									
Ethylbenzene									
O-Xylene									
P-Xylene									
Halogenated Compounds									
Chloromethane		NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride		NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane		NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	1.10					1.1			
Allyl chloride									
1,1-Dichloroethane						P<			
Cis-1,2-Dichloroethylene			1.30	1.40					
1,2-Dichloroethane							0.40	0.20	
1,1,1-Trichloroethane							0.30		
Bromodichloromethane									
2,3-Dichloro-1-Propene									
1,1-Dichloro-1-Propene									
1,1,2-Trichloroethylene									
Chlorodibromoethane									
Cis-1,3-Dichloro-1-Propene									
2-Chloroethylvinyl Ether		NA	NA		NA	NA		NA	NA
1,1,1,2-Tetrachloroethane									
1,1,2,2-Tetrachloroethane									

NOTES:

< .... Less than

P< .... Peak detected below the "less than" value

PP .... A peak was present

NA .... Not analyzed

units are ug/l

(continued)

TABLE 1-2 (continued)

VOLATILES

RESIDENT WELL OWNER:	NON-RESPONSIVE [redacted]								
DATE SAMPLED:	1/10/85	1/10/85	1/10/85	1/10/85	1/10/85	1/10/85	1/10/85	1/10/85	1/10/85
DATE ANALYZED:	1/15	1/15	1/15	1/15	1/15	1/15	1/15	1/15	1/15
Non-Halogenated Compounds									
Acetone									
Ethyl Ether	P<		P<			0.10		0.10	
Benzene									
Toluene									
Cumene									
M-Xylene									
Tetrahydrofuran									
Methyl Ethyl Ketone									
Methyl Isobutyl Ketone									
Ethylbenzene									
O-Xylene									
P-Xylene									
Halogenated Compounds									
Chloromethane	NA	NA	NA	NA	NA	PP	NA	NA	NA
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride						1.90		5.90	
Allyl chloride									
1,1-Dichloroethane						0.70		0.70	
Cis-1,2-Dichloroethylene			0.70			0.40			
1,2-Dichloroethane						P<			
1,1,1-Trichloroethane						0.40			
Bromodichloromethane									
2,3-Dichloro-1-Propene									
1,1-Dichloro-1-Propene									
1,1,2-Trichloroethylene									
Chlorodibromomethane									
Cis-1,3-Dichloro-1-Propene									
2-Chloroethylvinyl Ether									
1,1,1,2-Tetrachloroethane									
1,1,2,2-Tetrachloroethane									

NOTES:

(continued)

< .... Less than
P< .... Peak detected below the "less than" value
PP .... A peak was present
NA .... Not analyzed
units are ug/l

TABLE 1-2 (continued)

VOLATILES

RESIDENT WELL OWNER:	NON-RESPONSIVE [redacted]								
DATE SAMPLED:	7/25/84	7/25/84	10/9/84	5/4/82	7/25/84	5/23/84	5/23/84	5/23/84	5/23/84
DATE ANALYZED:	7/30	7/30	10/11	5/5	7/30	6/6	6/6	6/6	6/6
Non-Halogenated Compounds									
Acetone	40.00	16.00		<					
Ethyl Ether			1.20	<			P<		3.00
Benzene				<					
Toluene				<					
Cumene				<					
M-Xylene				<					
Tetrahydrofuran				<					12.00
Methyl Ethyl Ketone				<					
Methyl Isobutyl Ketone				<					
Ethylbenzene				<					
O-Xylene				<					
P-Xylene				<					
Halogenated Compounds									
Chloromethane	NA	NA		<	NA	NA	PP	NA	PP
Vinyl Chloride	NA	NA		<	NA	NA	NA	NA	NA
Chloroethane	NA	NA		<	NA	NA	NA	NA	PP
Methylene chloride			1.30	<					9.80
Allyl chloride				<					
1,1-Dichloroethane	0.30	0.40		<			0.20		1.90
Cis-1,2-Dichloroethylene				<					6.60
1,2-Dichloroethane				<		0.80	0.90		0.70
1,1,1-Trichloroethane	0.20	0.50		<					0.90
Bromodichloromethane				<	0.70				
2,3-Dichloro-1-Propene				<					
1,1-Dichloro-1-Propene									
1,1,2-Trichloroethylene									
Chlorodibromoethane					P<				
Cis-1,3-Dichloro-1-Propene									
2-Chloroethylvinyl Ether				-					
1,1,1,2-Tetrachloroethane				<					
1,1,2,2-Tetrachloroethane				<					

NOTES:

< .... Less than

P< .... Peak detected below the 'less than' value

PP .... A peak was present

NA .... Not analyzed

units are ug/l

(continued)

TABLE 1-2 (continued)

VOLATILES

RESIDENT WELL OWNER:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
DATE SAMPLED:	7/25/84	7/25/84	10/9/84	5/4/82	7/25/84	5/23/84	5/23/84	5/23/84	5/23/84
DATE ANALYZED:	7/30	7/30	10/11	5/5	7/30	6/6	6/6	6/6	6/6
Halogenated Compounds (continued)									
Pentachloroethane				<					
1,1,2-Trichlorotrifluoroethane				<					
1,2-Dichlorobenzene				<					
Dichlorodifluoromethane	PP	PP		<	NA	NA	PP	NA	PP
Bromomethane	NA	NA		-	NA	NA	NA	NA	NA
Dichlorofluoromethane	PP	PP		<	NA	NA	PP	NA	PP
Trichlorofluoromethane	0.20	0.50		<		P<	0.30		1.30
1,1-Dichloroethane				<					0.20
Trans-1,2-Dichloroethylene				<					
Chloroform	<P			<	2.40	P<			0.70
Dibromomethane				<					
Carbon Tetrachloride									
Dichloroacetonitrile				<					
1,2-Dichloropropane				<					0.20
Trans-1,3-Chloro-1-Propene				<					
1,3-Dichloropropane				-					
1,1,2-Trichloroethane				<					1.70
1,2-Dibromoethane				-					0.40
Bromoform				<					
1,2,3-Trichloropropane									
1,1,2,2-Tetrachloroethylene									3.00
Chlorobenzene									
1,3-Dichlorobezene									
1,4-Dichlorobezene									

NOTES:
< .... Less than
P< .... Peak detected below the "less than" value
PP .... A peak was present
NA .... Not analyzed
units are ug/l

TABLE 1-2 (continued)

VOLATILES

RESIDENT WELL OWNER:	Field Blank	[redacted]							
DATE SAMPLED:	1/10/85	4/23/85	4/23/85	7/25/84	4/23/85	4/23/85	10/9/84	10/12/84	4/23/84
DATE ANALYZED:	1/15	5/6	5/6	7/30	5/7	5/7	4/23	5/8	5/8
Halogenated Compounds (continued)									
Pentachloroethane									
1,1,2-Trichlorotrifluoroethane									
1,2-Dichlorobenzene									
Dichlorodifluoromethane		NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane		NA	NA	NA	NA	NA	NA	NA	NA
Dichlorofluoromethane		NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane									
1,1-Dichloroethane								P<	
Trans-1,2-Dichloroethylene									
Chloroform									
Dibromomethane									
Carbon Tetrachloride									
Dichloroacetonitrile		NA	NA	NA	NA	NA	NA	NA	
1,2-Dichloropropane									
Trans-1,3-Chloro-1-Propene									
1,3-Dichloropropane		NA	NA	NA	NA	NA	NA	NA	
1,1,2-Trichloroethane									
1,2-Dibromoethane									
Bromoform									
1,2,3-Trichloropropane		NA	NA	NA	NA	NA	NA	NA	
1,1,2,2-Tetrachloroethylene									
Chlorobenzene									
1,3-Dichlorobezene									
1,4-Dichlorobezene									

NOTES:

(continued)

< .... Less than
P< .... Peak detected below the "less than" value
PP .... A peak was present
NA .... Not analyzed
units are ug/l

TABLE 1-2 (continued)

VOLATILES

RESIDENT WELL OWNER:	[redacted]								
DATE SAMPLED:	1/10/85	1/10/85	1/10/85	1/10/85	1/10/85	1/10/85	1/10/85	1/10/85	1/10/85
DATE ANALYZED:	1/15	1/15	1/15	1/15	1/15	1/15	1/15	1/15	1/15
Halogenated Compounds (continued)									
Pentachloroethane									
1,1,2-Trichlorotrifluoroethane									
1,2-Dichlorobenzene									
Dichlorodifluoromethane	NA	NA	NA		NA	PP	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorofluoromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane						0.20	0.20		
1,1-Dichloroethane									
Trans-1,2-Dichloroethylene									
Chloroform									
Dibromomethane									
Carbon Tetrachloride									
Dichloroacetonitrile									
1,2-Dichloropropane									
Trans-1,3-Chloro-1-Propene									
1,3-Dichloropropane									
1,1,2-Trichloroethane									
1,2-Dibromoethane									
Bromoform									
1,2,3-Trichloropropane									
1,1,2,2-Tetrachloroethylene									
Chlorobenzene									
1,3-Dichlorobezene									
1,4-Dichlorobezene									

NOTES:

(........ Less than

P(....... Peak detected below the "less than" value

PP .... A peak was present

NA .... Not analyzed

units are ug/l

(continued)

TABLE 1-3

VOLATILES FOUND IN GROUND WATER

	Lowest	Highest
Methylene Chloride	1.0	46.0
1,1-Dichloroethane	0.3	5.4
cis 1-2-Dichloroethylene	0.2	27.0
1,1,2-Trichloroethylene	0.2	2.7
Trichlorofluoromethane	0.2	5.6
1,1-Dichloroethylene	0.2	1.7
1-2,Dichloropropane	0.2	1.7
Vinyl Chloride		
Chloromethane		
Dichlorofluoromethane		
Bromomethane		
1,2-Dichloroethane	0.1	4.2
1,1,1-Trichloroethane	0.2	8.8
Dichlorodifluoromethane		
Acetone	16.0	100.0
Ethyl Ether	0.1	60.0
Benzene	0.3	3.1
Toluene	0.5	6.8
Total Xylenes	0.6	8.2
Tetrahydrofuran	0.5	130.0
Ethyl Benzene	0.5	8.0
1,1,2,2-Tetrachloroethylene	2.0	16.0
Chloroform	0.2	2.4
Chloroethane		
1,1,2,2-Tetrachlorethane	2.0	4.6
1,2-Dibromomethane	0.4	0.7
Bromodichloromethane	0.2	0.7
1,2-Dibromoethane	0.4	0.7
Trichloroethene	0.2	2.8
Methyl Isobutyl Ketone	5.0	6.0
1,1-Dichloro-1-Propane	0.2	1.8

All values in micrograms/liter.

If no Lowest-Highest value is given, the volatile organic compound was detected as a peak below the detection level.

landfill, south of Anne Street (38th Street), north of Robertson Street (34th Street), and west of Bemidji Avenue North. Four other contaminated wells are located east of Bemidji Avenue North, one was located north of Anne Street and one south of 34th Street. A review of 1985 data collected in January and April (believed to be the most recent data) revealed that the W. Elliot well within the three block area, which had originally show contamination, had improved. However, the M. F. Field well also within the three block area, that was originally clean was then found to contain organic compounds. Also, the D. Miller well located east of Bemidji Avenue, which had been clean in 1984 was now contaminated. One other previously sampled well (W. Cameron) located south of Robertson Street was found to be contaminated.

No new organic contaminants were found in the 1985 data. The concentrations of some parameters increased while others either decreased or were no longer found. Overall, concentrations were slightly lower. Plate 2 which shows the locations of those private wells discussed above, except for the M. Wesloh and W. Cameron wells which could not be found on the available tax map excerpt.

Those wells which had shown quantifiable concentrations of organic contamination were grouped by depth. Both the Channel 26 television station well which is is 117 feet deep, and the Hillcrest Manor Mobile Home Park well, which is assumed to be over 100 feet deep, did not show detectable levels of organic contaminants. Only four out of 10 wells in the depth range of 40 to 90 feet had detectable levels of contaminants. Six out of eight wells were contaminated in the 30 to 40-foot range, six out of 13 in the 20 to 30-foot range and two out of four in the 10 to 20-foot range. The proportionately large number of contaminated wells in the 30 to 40-foot range may be due to the accumulation of organics denser than water on top of a clay layer believed to be 36 to 45 feet below the surface. The above statistics do not include approximately 15 wells which were described as either shallow or deep or for which there was no information on depth. In summary, the organic contaminants are primarily distributed in the shallow sand zone which is believed to exist above a clay layer 36 to 45 feet below the surface.

1.3.4 Summary

A review of existing water quality data indicates over 30 wells with detectable levels of organic compounds but only the [redacted] (see Figure 1-2) exceeds 10 ppb total volatile organics which is sometimes recognized as a threshold for action. Many of these are priority pollutants considered carcinogenic. Some of the compounds, namely, acetone, chloroform, methylene chloride, and ethyl ether are common laboratory and field reagents which may have contaminated the ground water samples after they were collected. Methylene chloride was found in at least two field blanks. Two upgradient private wells, the Alano well and the hospital maintenance well contained detectable levels of acetone, chloroform and bromodichloromethane. These substances were also detected in downgradient private wells.

Typical landfill inorganic leachate parameters were either not found or were only slightly elevated in the four shallow downgradient private wells sampled. However, these wells showed the presence of several organic contaminants. The Pierce well showed relatively high concentrations of organic compounds in at least one sampling survey.

The contradiction between inorganic and organic data, and the presence of some of the organic compounds in upgradient wells and in field blanks, necessitates validation of the existing ground water quality data from the private wells. For these reasons this Work Plan proposes an inspection and sampling of 20 private wells following installation of the first phase of proposed monitoring wells. This survey will provide a better data base for inorganic water quality parameters and will update the data for wells which have not been sampled since 1984. The well inventory, which is also proposed in this Work Plan, will provide additional essential information on existing well depths and the condition and location of some wells which could not be located on the basis of available information. Efforts to locate this information and to enter it into computer file systems will continue through the RI. These data will be placed on disks compatible with MPCA computer hardware and software. Computerization of the data will facilitate various types of data analysis (tabulation, graphs, statistics) necessary for evaluating and modeling the data and for estimating a long-term monitoring strategy.

KUMMER SANITARY LANDFILL
BEMIDJI, MINNESOTA

NON-RESPONSIVE

[redacted]

FIGURE 1-2

1.4 Topographic Survey

A site map of the landfill was prepared and shows existing structures, roads, and monitoring wells. The site map has a horizontal scale of 1 inch = 100 feet and a contour interval of 2 feet. An orthophoto map of an area surrounding the landfill including the affected residential areas discussed earlier was also prepared. It has a horizontal scale of 1 inch = 250 feet. These maps have been included as Plates 1 and 2, respectively and will be used further as a base maps for information generated in the RI.

Elevations for the ground surface locations of four on-site monitoring wells located by the Project Team were also obtained. This information will be provided if these wells are used in the RI.

1.5 Problem Assessment

A review of available data regarding ground water contamination in Northern Township indicates that a likely source of ground water contamination is the Kummer Sanitary Landfill. This is primarily due to contaminants found in wells downgradient of the landfill. It is noted that available documentation does not indicate the past disposal of significant quantities of hazardous or toxic wastes. It is thought that such wastes, if disposed of in the landfill, were deposited in small amounts as normally occur in typical municipal waste. The residential wells found contaminated generally lie east of the landfill in what is considered the downgradient direction. However, other private wells known to be contamianted are found further distances from the landfill to the east close to Lake Bemidji.

While it is possible that contaminants may have migrated to those areas, it is also conceivable that additional, but closer, sources of contamination are present. These sources will be further investigated through the conduct of the Potential Responsible Party Search.

Consideration is also given to the potential that localized ground water contamination is caused by the presence of private septic disposal systems. The leaching of various chemicals found in household waste may pass through septic disposal systems to ground water and subsequently towards and into nearby shallow potable wells. The work plan proposes to investigate this possibility during RI activities.

1.6 Health and Environmental Risks

Primary health risks associated with the contaminated ground water problem is the ingestion of contaminated ground water through affected potable wells. This problem has been minimized since residents in the affected area have been advised to switch to alternate potable water sources. A secondary concern is the possible presence of hazardous materials, if any, within the landfill. While the site is presently inactive, a potential exists that any future disturbances could result in significant releases of such materials to the environment.

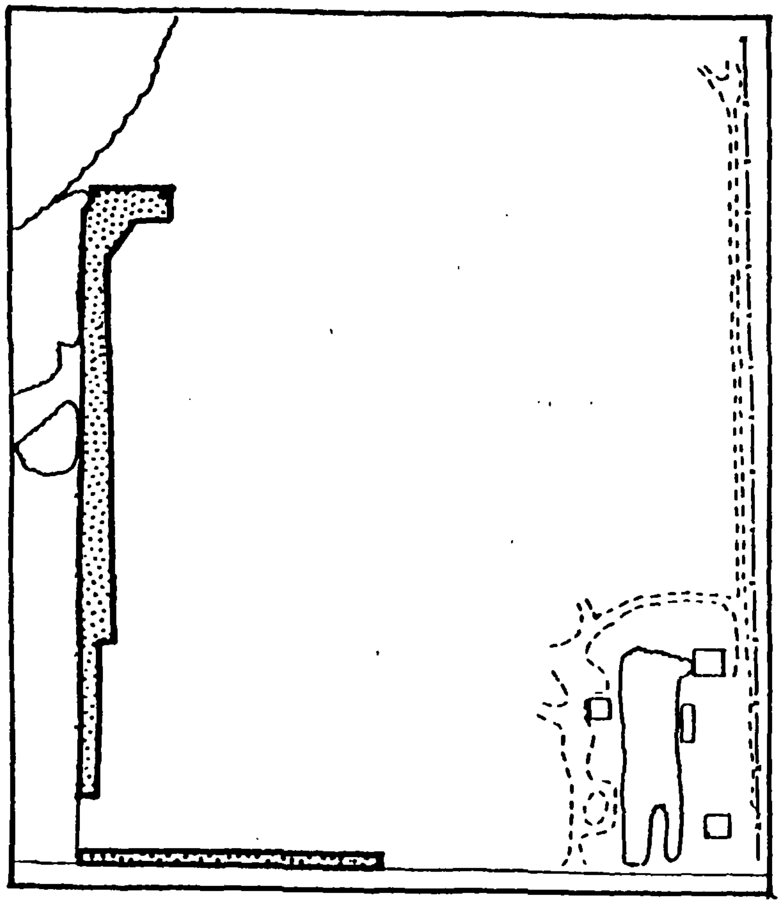
1.7 History of Site Operations

The discussion in this section focuses on a history of landfilling operations at the Kummer Landfill. It consists primarily of two parts: a series of sketches depicting locations of landfilling in the site at successive stages of its development, and a chronological listing of important events, activities, and legal actions concerning the permittees, Jon and Ruth Kummer. The sketches are included in the body of the report, while the chronology is found in Appendix A-3.

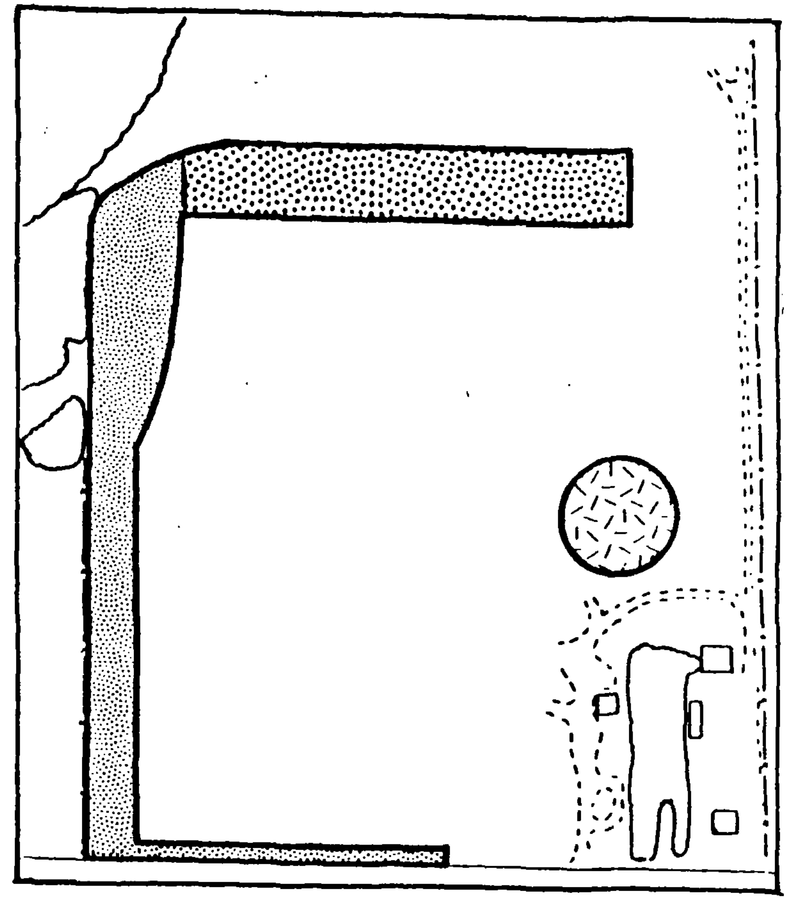
The series of sketches (Figures 1-3 through 1-5) for the landfill were developed using data from a variety of sources. These include aerial photography, surface photography, site operation reports, MPCA site inspection reports, and conversations with MPCA personnel. The resultant sketches represent a compilation of all the data available.

The primary source of inforamtion for the sketches consist of a set of black and white aerial photographs. These photos were acquired from private companies, as well as state, county, and local agencies. One or more photographs were obtained for each of the following years: 1969, 1972, 1974, 1976, 1979, 1981, 1982, 1983, and 1985.

Each sketch shows the landfill as it appeared at a given time. Areas of disturbance are outlined in heavy black lines on each sketch, and within this disturbed area are shown active fill areas, previously filled areas, and borrow areas.



KUMMER LANDFILL BEMIDJI, MINNESOTA
MAY 1972



KUMMER LANDFILL BEMIDJI, MINNESOTA
1974

AREA OF DISTURBANCE

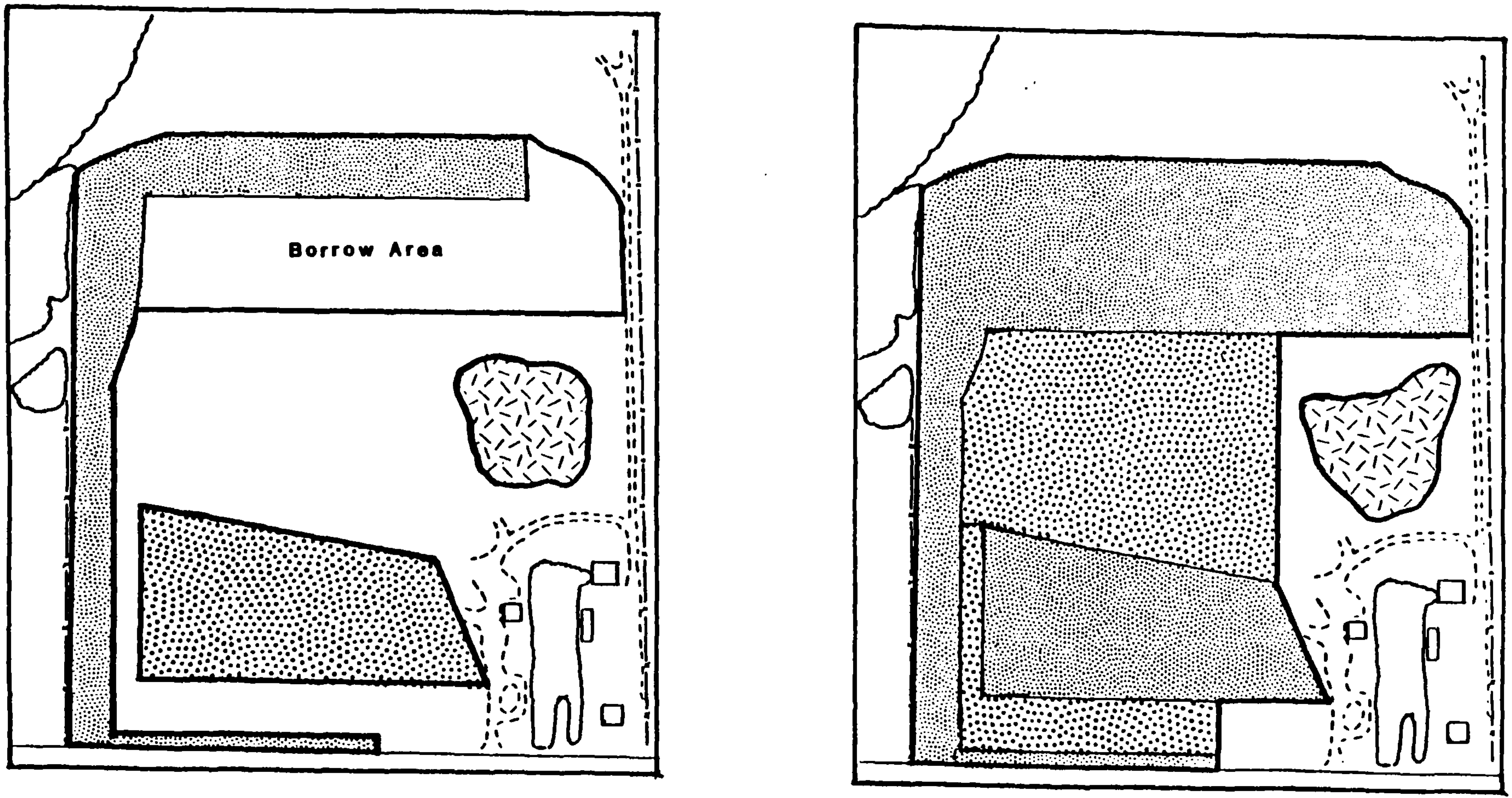
PRESENT FILL AREA

PREVIOUSLY FILLED AREA

DEMOLITION AREA

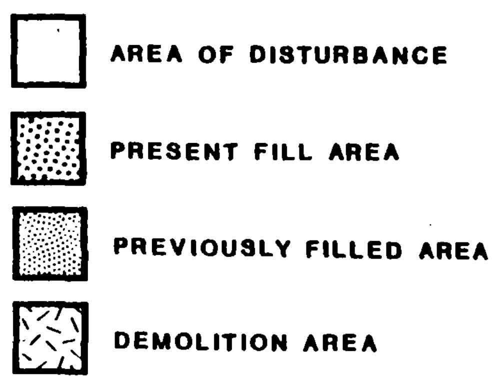
KUMMER SANITARY LANDFILL
NORTHERN TOWNSHIP , MINNESOTA
HISTORY OF SITE OPERATIONS

FIGURE 1-3



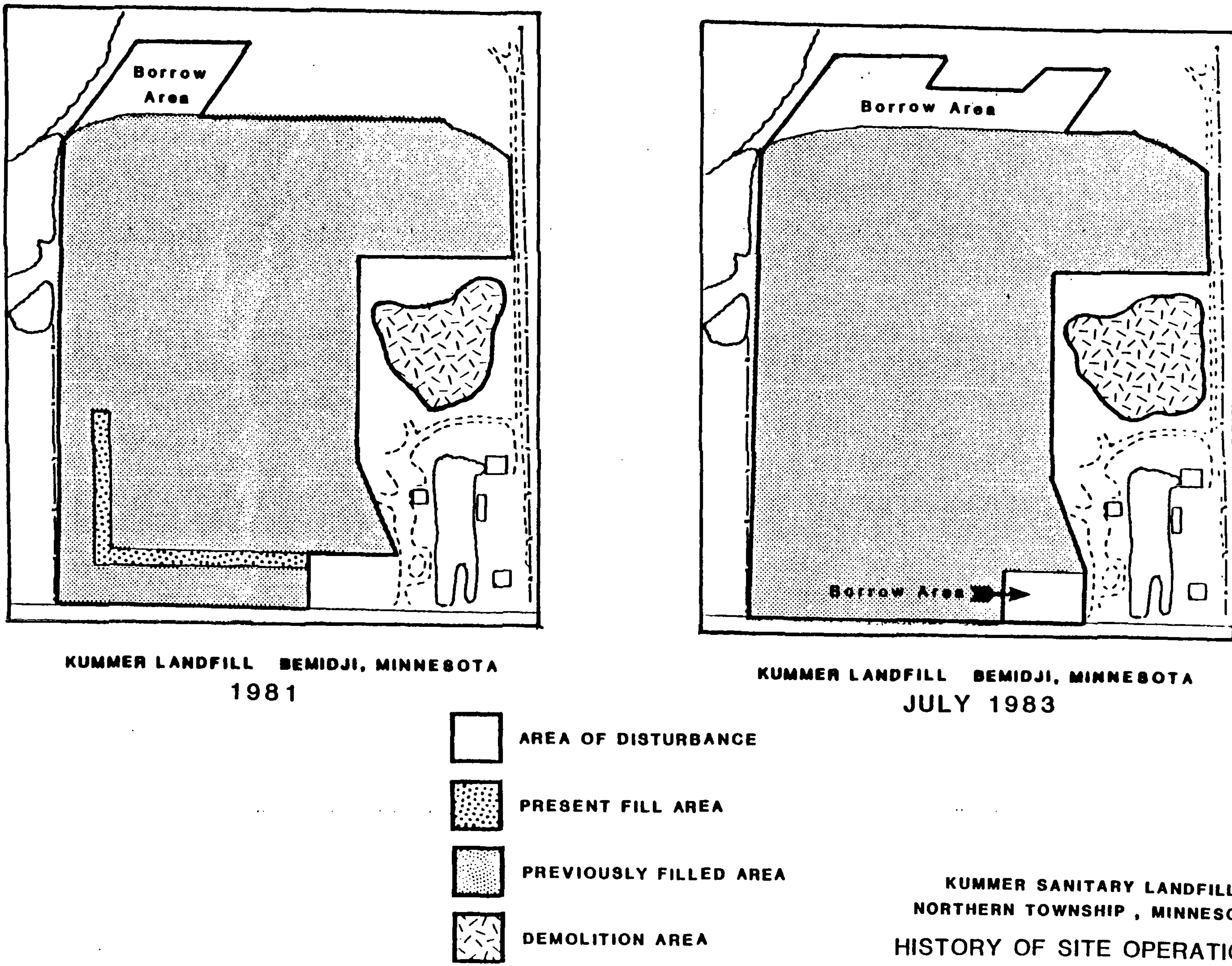
KUMMER LANDFILL BEMIDJI, MINNESOTA
AUGUST 1976

KUMMER LANDFILL BEMIDJI, MINNESOTA
MAY 1979



KUMMER SANITARY LANDFILL
NORTHERN TOWNSHIP , MINNESOTA
HISTORY OF SITE OPERATIONS

FIGURE 1-4



KUMMER SANITARY LANDFILL
NORTHERN TOWNSHIP, MINNESOTA
HISTORY OF SITE OPERATIONS

FIGURE 1-5

Because of the wide variability in the scale and quality of the aerial photographs, additional information was needed to adequately differentiate between active and inactive portions of the landfill. Approximately 200 color slides of the site were found in files of the MPCA. These slides were taken by MPCA personnel during regular site inspections. In addition to providing important documentation concerning active trench locations, a number of violations of landfill operation are shown in the photographs. Violations most frequently noted include failure to provide adequate cover, failure to control litter and blowing of debris, and improper grading of the cover material leading to surface water drainage into active trenches.

In addition to photographic analysis, information for the sketches originated from examination of MPCA Solid Waste Facility Site Inspection Reports and Site Operation Reports. Conversations with Mr. Larry Olson, Regional Inspector based in the MPCA's Detroit Lakes Office, helped to tie all the reports and photographs together.

The site, opened in 1971, operated under MPCA permit SW-31. From 1971 to November of 1984 the landfill accepted material described only as mixed-municipal waste. Examination of MPCA files reveal no further classification of the material beyond this description. The waste was deposited in the landfill using a trench-and-fill technique. Early trenches were located along the southern, western, and northern borders of the property. Cover material was excavated from borrow areas within the landfill. In some cases, these borrow areas later became active fill site.

In 1974, a demolition area was opened at the landfill. This area, located near the eastern edge of the site and noted on Figure 1-3, contains large quantities of fly ash and sawdust. The fly ash most likely originated from Bemidji State University, based upon correspondence between Mr. Kummer and the school. The sawdust likely originated at the Superwood Company also in Bemidji, and may represent the scrap material from the many pressed wood products manufactured there.

In October of 1984, the permittee ceased to accept any waste at the landfill, except for demolition debris which was used to fill holes and depressions in order to facilitate closure activities at the landfill. On

June 25, 1985, the MPCA issued an order to close the landfill permanently and to begin ground water monitoring at the site.

1.8 Identification of Alternate Response Actions

A list of potentially feasible alternative response actions for the Kummer Landfill has been developed and is presented Table 1-4. This list includes a description of advantages, disadvantages and costs for each alternative. Cost estimates are tentative since site specific subsurface conditions are largely unknown. Cost figures for response actions and associated technologies which have been considered are based on in information from Voytek, 1983 and are not adjusted for inflation.

Each alternative has been evaluated in terms of available information of site characteristics; waste characteristics; desired degree of environmental control; construction, operation, and maintenance costs; and public acceptance. The literature will be reviewed throughout the planning and execution of this project to identify new technologies or modifications of existing technologies for applicable remedial measures for the Kummer site.

Possible remedial alternatives identified in Table 1-4 are discussed next. It is noted that all identified remedial alternatives will be considered for use throughout the RI since there is a possibility that new information developed may indicate the practicability of an alternative presently thought to be unfeasible on the basis of incomplete or incorrect information.

Remedial alternatives tentatively considered unfeasible include grout curtains, steel sheet piling, permeable treatment beds, and chemical neutralization. Grout curtains and sheet piling, and activated carbon treatment beds, are thought unfeasible because of their expense and the lack of confidence in their effectiveness. Due to the organic contaminants present in the ground water, the crushed limestone and glauconite green sands are considered inappropriate. These materials are more effective in controlling pH and heavy metals which, at this time, do not appear to be the primary problem at this site. Chemical neutralization is not considered viable because this technology has not been sufficiently developed or proven. In addition, this procedure may result in direct or indirect contamination of the ground water.

TABLE 1-4

POTENTIAL REMEDIAL ALTERNATIVES

Advantages	*Disadvantages*	Costs (millions of dollars)
1. Capping:		
Inexpensive (compared to removal). Equipment and technology readily availabile. Reduces leachate production via control of storm water entrance into the waste cells, which will also reduce differential settling of the landfill surface. Source of claywill have to be found locally.	Will not control ground water underflow and possible exposure to wastes in landfill.	0.07 to 0.150 (does not include long-term maintenance cost)
2. Grout Curtain (see Figure 1-5):		
Can be applied to greater depths than slurry walls. More effective in very permeable soils.	Limited number of contractors available. Extensive testing required. Expensive. Difficult to evaluate effectiveness (cannot assure a good seal).	2.0 to 4.8
3. Steel Sheet Piling:		
Easily installed and readily available. Relatively inexpensive. Low maintenance.	Difficult installation in soils containing cobbles and boulders. Initially not waterproof. May corrode and leak. Difficult to evaluate effectiveness.	2.2 to 3.4
4. Slurry Wall:		
Less expensive than Item Nos. 2 and 3 above. Fairly effective (80-85%). Relatively low maintenance cost.	Sensitive to high hydraulic heads and corrosive leachates. Expensive.	1.8 to 2.9

TABLE 1-4

POTENTIAL REMEDIAL ALTERNATIVES
(Continued)

Advantages	Disadvantages	Costs (millions of dollars)
5. Permeable Treatment Beds (see Figure 1-6):		
a. Activated Carbon:		
	Requires extensive research, bench type testing, and field sampling.	
Effective in removal of nonpolar organic compounds.	Limited technology.	15 to 20
Easily installed and readily available.	Effectiveness uncertain.	
	Limited to depth of backhoe excavations.	
	Expensive.	
	Recontamination possible.	
	Will become plugged and ineffective within a few years.	
	May require reactivation.	
b. Crushed Limestone:		
Relatively inexpensive.	Limited to depth of backhoe excavation.	0.2 to 0.8
Readily available and easily installed.	Effective in neutralizing acid leachate and causing precipitation of some metals.	
	Requires maintenance.	
	May recontaminate ground water.	
	May add other contaminants (calcium, magnesium, TDS) to ground water.	

TABLE 1-4

POTENTIAL REMEDIAL ALTERNATIVES
(Continued)

Advantages	Disadvantages	Costs (millions of dollars)
c. Glauconite Green Sands:		
Similar to crushed limestone except not readily available in Minnesota.	Similar to crushed limestone but may remove more dissolved solids.	0.3 to 1
6. Hydrodynamic Control:		
a. Water table adjustment by pumping wells (lower water table below buried waste):		
Technology readily available.	Requires maintenance over indefinite period.	Installation costs: 0.3 to 0.5
Initially relatively inexpensive.	Complete elimination of storm water percolation through waste is required.	
Simple to control.	Long-term expense.	Maintenance (Operational Costs): 0.001 to 0.003 per year
Flexible design.	Effectiveness assumes hydrogeology is well defined.	
	Requires frequent monitoring.	
b. Extraction/Injection Wells (extract contaminated ground water and reinject to contain contaminant plume):		
Similar to No. 6.a above.	Similar to No. 6.a above.	0.7 to 1.2
c. Extraction/Discharge Wells (extract and discharge ground water, see Figure 1-6):		
Similar to No. 6a above.	Similar to No. 6.a. above.	0.5 to 2

TABLE 1-4

POTENTIAL REMEDIAL ALTERNATIVES
(Continued)

Advantages	Disadvantages	Costs (millions of dollars)
d. Extraction Wells/Treatment/ Injection Wells (see Figure 5):		
(This method is similar in advantages and disadvantages to Nos. 6.a, b, and c, above but is more expensive due to required aeration or carbon absorption treatment of the ground water.)		
e. Interceptor Trench (including treatment of ground water and discharge):		
Technology and equipment readily available.	Requires dewatering for installation.	
	Less flexible than use of wells.	1.5 to 4
	Limited to depth of backhoe excavation and nature of shallow sediments. Long-term maintenance.	
7. Bioreclamation (see Figure 1-8):		
Effective removal of hydrocarbon and some organics.	May not remove chlorinated solvents.	0.4 to 2
Relatively inexpensive over short term.	May result in indirect quality changes in ground water (not acceptable to MHD). Requires injection wells maintenance problems.	

MALCOLM PIRNIE

TABLE 1-4

POTENTIAL REMEDIAL ALTERNATIVES
(Continued)

Advantages	Disadvantages	Costs (millions of dollars)
8. Chemical Neutralization (In-Situ Treatment):		
Relatively inexpensive over short term.	Requires injection of chemical which may directly contaminate ground water. Requires extensive testing and research. Requires injection wells (maintenance cost). Effectiveness questionable.	Depends on chemicals used.
9. Complete Removal of Waste:		
Would eliminate the source of contaminants.	Would not eliminate existing contaminated ground water. Expensive. Generally contrary to USEPA and MPCA policy. Limited to extremely toxic sites.	2 to 3 plus cost of cleanup of existing ground water contamination.
10. Alternative Water Supply:		
Municipal water system, bottled water, cisterns, above-ground tanks, deeper wells, and individual water treatment (GAC).		
11. Combination of Alternatives:		
In many cases a combinatin of two or more of the above alternatives may be appropriate.		

TABLE 1-4

POTENTIAL REMEDIAL ALTERNATIVES
(Continued)

Advantages	Disadvantages	Costs (millions of dollars)
12. No Action:		
Investigations may indicate no further action be taken. However, it is likely that the project team will recommend, as a minimum, capping, grading and reseeding the landfill, proper abandonment of unnecessary monitor wells and continued monitoring of remaining monitor wells.		

SEMICIRCULAR GROUT CURTAIN AROUND UPGRADIENT END OF LANDFILL

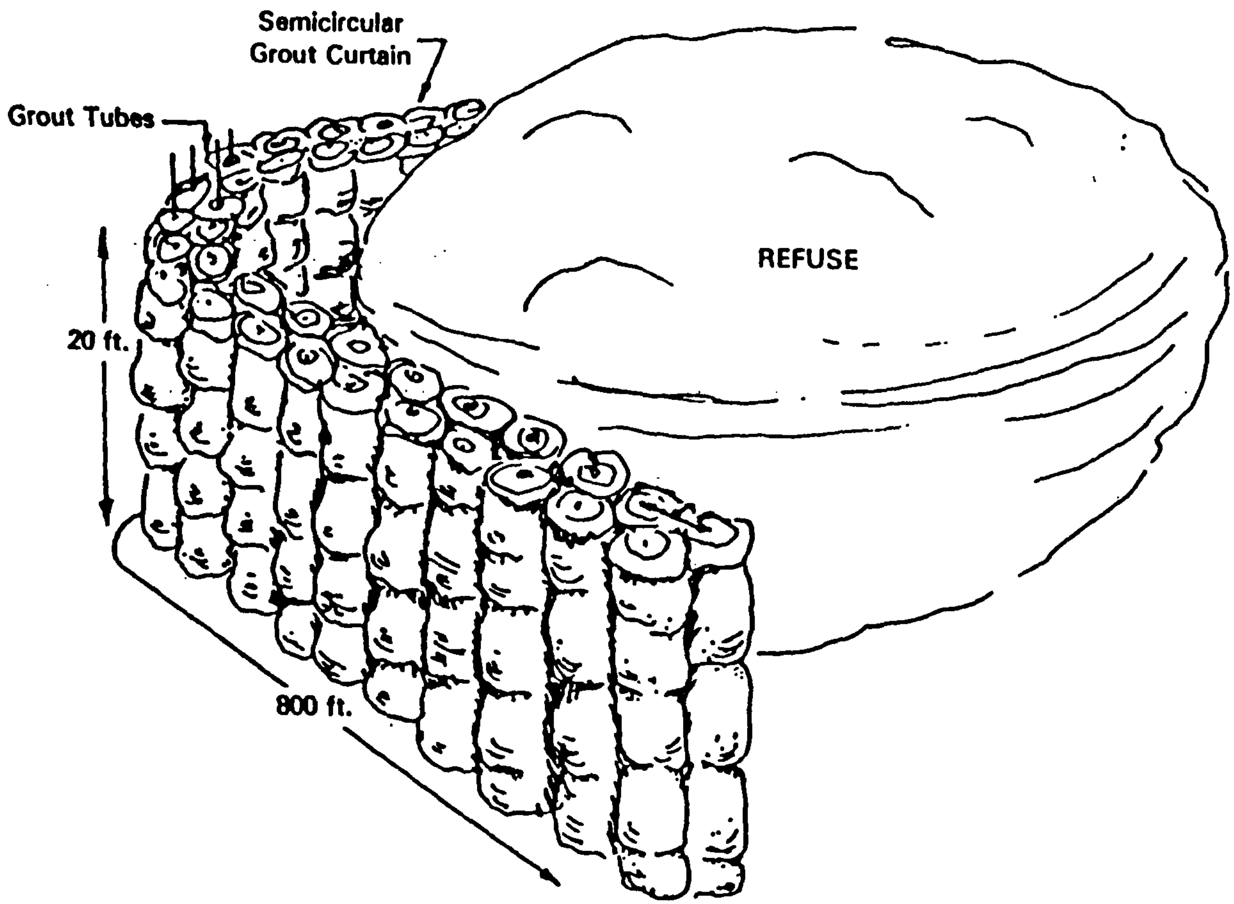
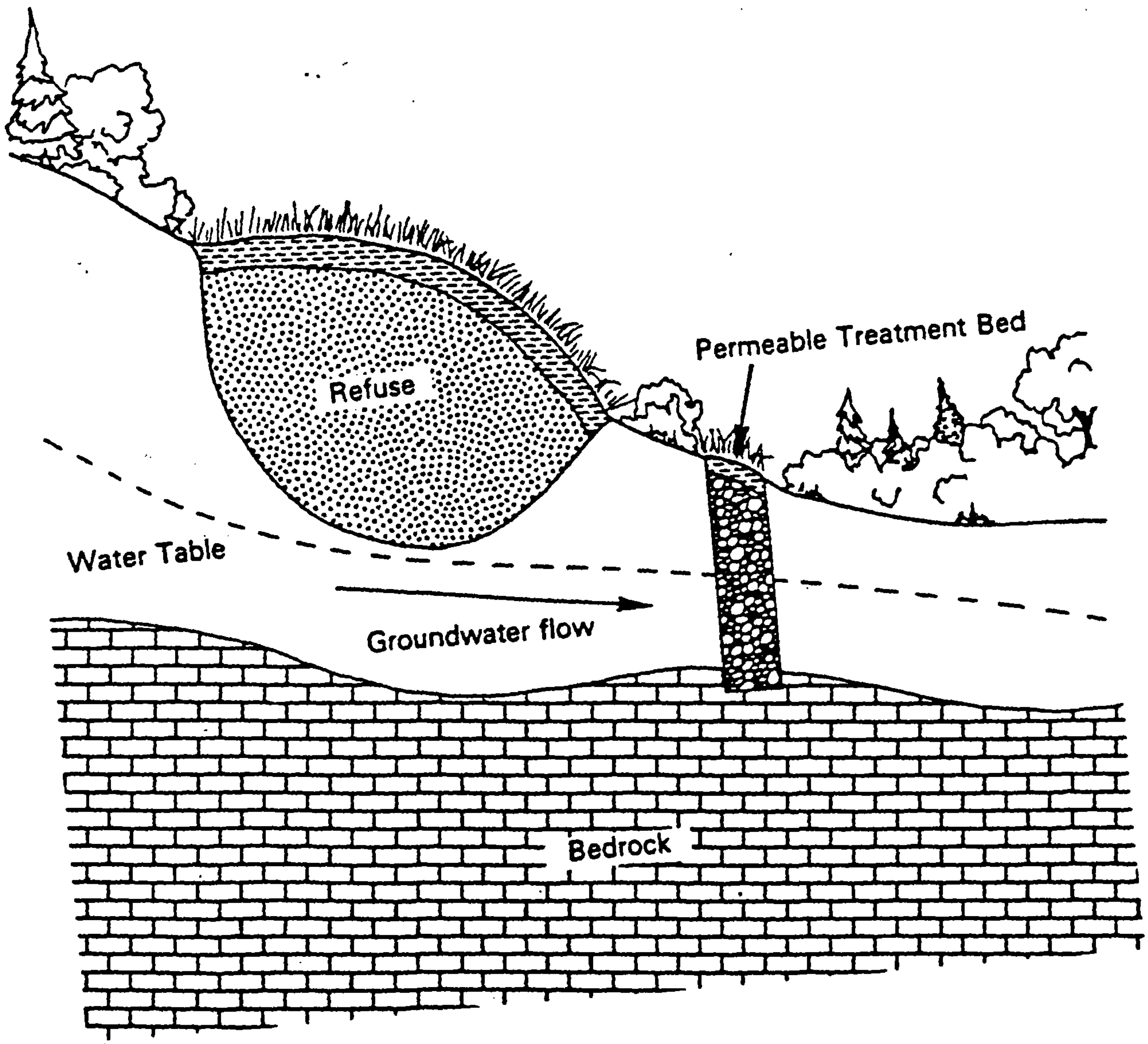


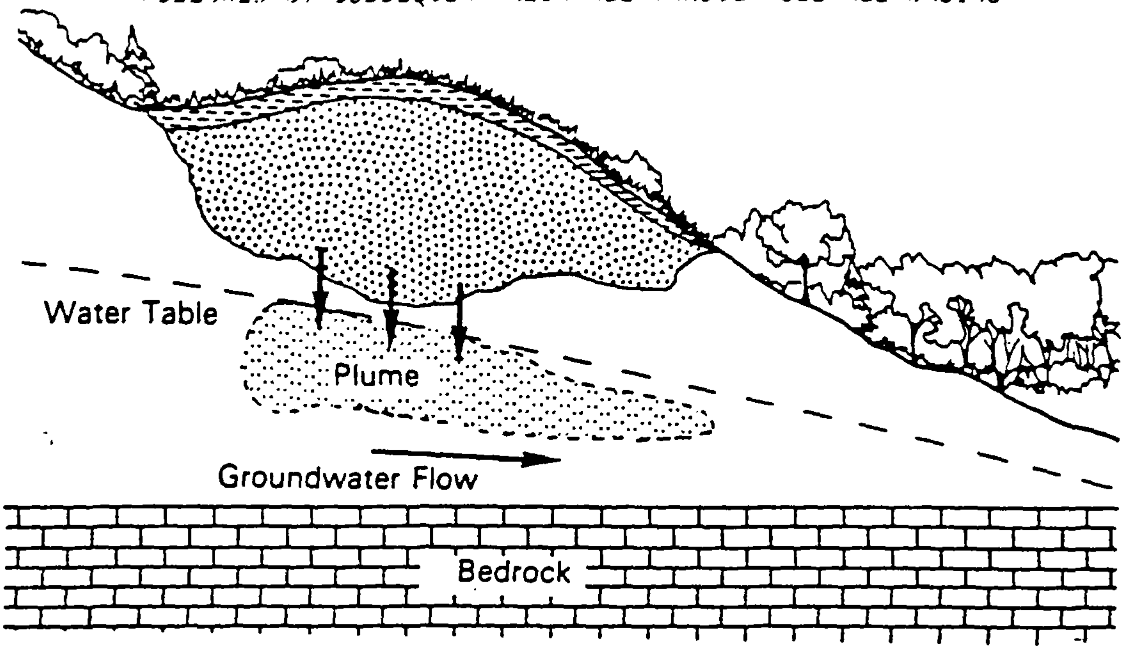
FIGURE 1-6

INSTALLATION OF A PERMEABLE TREATMENT BED

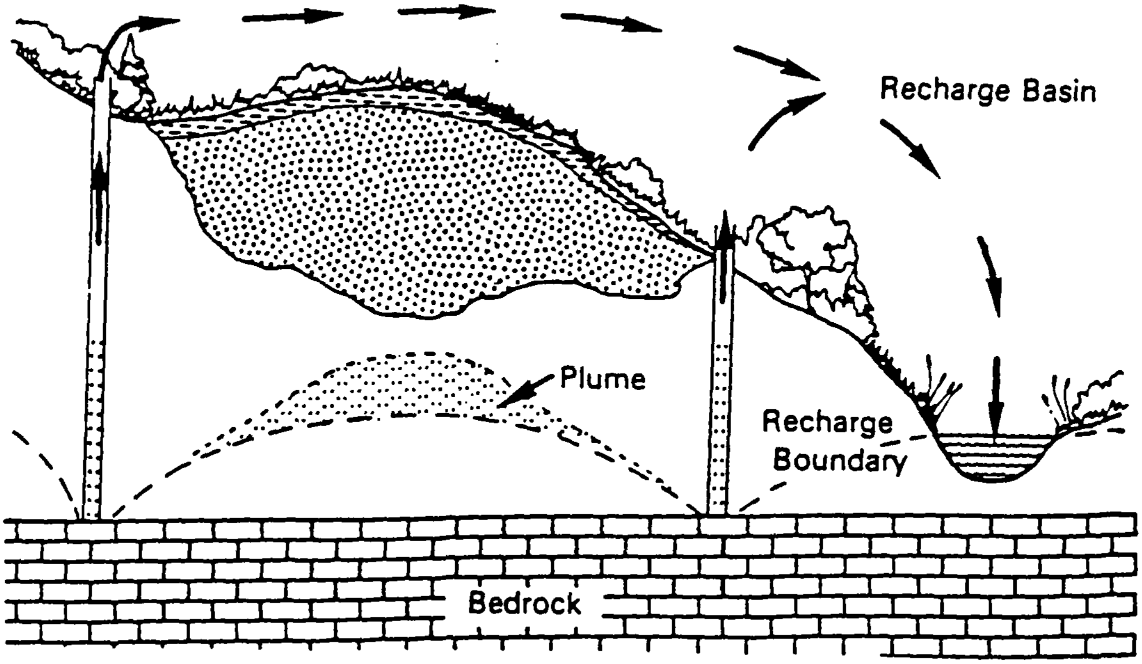


USE OF EXTRACTION WELLS FOR PLUME CONTAINMENT

FOLLOWED BY SUBSEQUENT RECHARGE THROUGH SEEPAGE BASINS

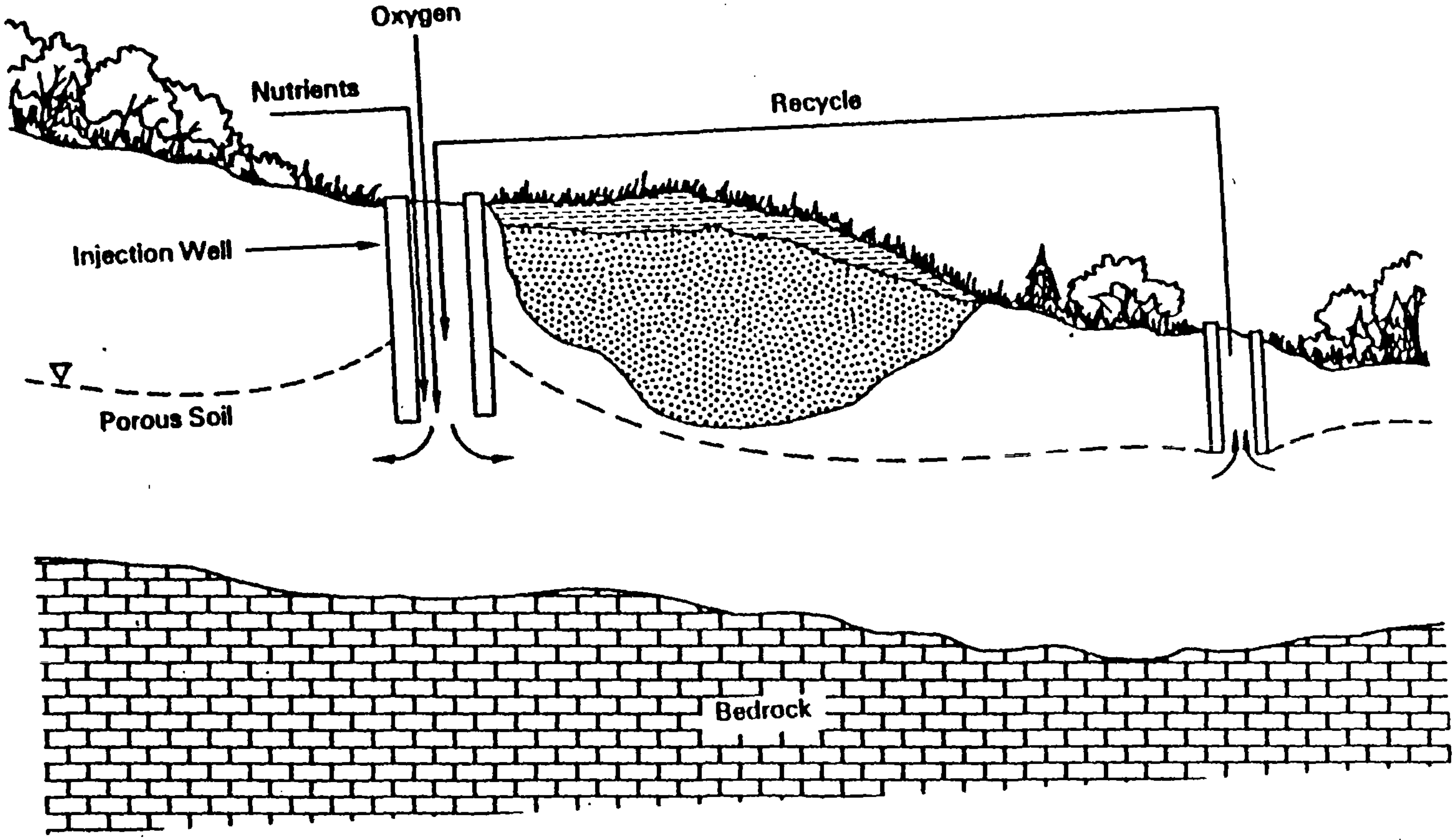


Before Pumping



After Pumping

TREATMENT OF THE CONTAMINATED GROUNDWATER WITH THE BIORECLAMATION TECHNIQUE



FIGURE

SELECTED REFERENCES

Army Map Service, 1954 (Limited Revision, 1965), Bemidji, Minnesota, 1:250,000 scale.

Beltrami County Soil Survey, Descriptions of the soil map for Sections 33 and 34, T147N, R33W (Draft): Correspondence from R. E. Rolling, November 1985.

Hobbs, H. C. and J. E. Goebel, 1982, Geologic Map of Minnesota Quaternary Geology. Minnesota Geological Survey; University of Minnesota.

Hult, M. F., editor, 1984, Ground-Water Contamination by Crude Oil at the Bemidji, Mn., Research Site: USGS Toxic Waste-Ground-Water Contamination Study: U.S.G.S. Water-Resources Investigations Report 84-4188, 107 p.

Jakes, Donald, May 24, 1982, Kummer Sanitary Landfill Monitoring Data (SW-31), Memo to G. W. Meyer, Chief Regulatory Compliance Section, from D. Jakes, Program Development & Facility Review Section.

Kanivetsky, Roman, 1979, Hydrogeologic Map of Minnesota, Quaternary Hydrogeology: Minnesota Geologic Survey, University of Minnesota, State Map Series S-3.

Keely, Joseph, Fall 1983, Chemical Time Series Sampling: Ground Water Monitoring Review, Water Well Journal Publishing Co., Worthington, Ohio, Vol. 2, No. 4.

Kummer, Charles, August 16, 1985, Personal Communication.

Mackay, D. M., P. V. Roberts, J. A. Cherry, 1985, Transport of Organic Contaminants in Groundwater: Environmental Science & Technology, American Chemical Society, Washington, D.C., Vol. 19, No. 5, May.

Martinez Mapping and Engineering, October 31, 1985, Aerial Photographs and Topographic Maps for Kummer Landfill, Bemidji, Minnesota.

Minnesota Department of Natural Resources Simple Bouger Gravity Map of MN, Bemidji Sheet.

MPCA, June 25, 1985, Agenda Item Control Sheet, and Findings of Fact, Conclusions, and Order.

Nelson, Bruce, MPCA Hydrologist, Div. of Solid & Hazardous Waste, August 16, 1985, Personal Communication.

Oakes, E. L. and L. E. Bidwell, 1968, Water Resources of the Mississippi Watershed, North-Central Minnesota, U.S. Geol. Survey Hydrogeologic Investigations Atlas, HA-278.

Olsen, B. M., and John H. Mossler, 1982, Geologic Map of Minnesota, Bedrock Topography, Minnesota Geological Survey, 1982.

Olson, L. E., MPCA Pollution Control Specialist Senior, August 16, 1985, Personal Communication.

Olson, L. E., MPCA Pollution Control Specialist Senior, 1972 through 1985, Landfill Site Inspection Reports.

Olson, L. E., MPCA Pollution Control Specialist Senior, 1972 through 1985, Landfill Site Inspection Reports.

Riner, Stephen D., Solid & Hazardous Waste Division, November 26, 1985, Personal Communication.

Sims, P. K., and G. B. Morey, editors, 1972, Geology of Minnesota: A Centennial Volume: Minnesota Geological Survey, St. Paul, Minnesota, 632 p.

Sunde, G. M., 1980, Evaluation of the Kummer Sanitary Landfill, Private Consultant's report to Jon Kummer.

Todd, J. E., 1899, The Geology of Beltrami County, Minnesota Geological Survey Final Report, Vol. 4, pages 131-157.

Trippler, Dale, and T. P. Clark, 1982, Ground Water Quality Monitoring Program, A Compilation of Analytical Data for 1981: Pollution Control Agency, Division of Solid and Hazardous Waste, Volume 4.

U.S.E.P.A., 1982, Handbook For Remedial Action At Waste Disposal Sites: Municipal Environmental Research Lab. Cincinnati, Ohio, EPA 625/6-82-006, 191 p.

U.S. Geol. Survey, 1972, Peterson Lake Quadrangle, Minnesota - Beltrami Co., 7.5 Minute Series Orthophoto map.

Voytek, John, August 25, 1983, Course on Ground Water Monitoring Design by Bennett, Gass, & Williams, Consulting Geologists: Wright State University, Dayton, Ohio.

APPENDIX A

MALCOLM PIRNIE

APPENDIX A

CHAPTER 1

MALCOLM PIRNIE

APPENDIX A-1

DONALD JAKES MEMO OF MAY 24, 1984

MALCOLM PIRNIE

SF-00006-01

Willie Mattison / Larry Olson
Detroit Lakes

STATE OF MINNESOTA

Office Memorandum

DEPARTMENT POLLUTION CONTROL AGENCY

TO : Gordon W. Meyer, Chief
Regulatory Compliance Section
Solid and Hazardous Waste Division

THRU: Tom Clark, Head, Ground Water Surveys Unit

FROM : Don Jakes, Hydrologist DLJ
Program Development and
Facility Review Section

DATE: MAY 24 1982

PHONE: 7-2717

RECEIVED
MAY 28 1982
MN. POLLUTION CONTROL AGENCY
DETROIT LAKES, MINNESOTA

WM	SR
SO	
JM	
FILE	

SUBJECT: KUMMER SANITARY LANDFILL MONITORING DATA (SW-31)

Attached is a compilation of the historical ground-water monitoring data from Kummer Sanitary Landfill as we understand it as of April 30, 1982. Compilation was complicated by:

1. The same names or SWIFMS designators being applied to different wells at various times (unreported to MPCA).

2. Mix-ups in labeling wells on lab data sheets.

3. MPCA records scattered or missing (we don't have lab data sheets for many of the reported analyses from three wells and only have the transcribed SWIFMS data, some of which may also have problems of data being matched to the wrong well numbers).

We think all the data attached are correct, but even so, four more points should be raised.

1. There are only one or two analyses from most of the wells.

2. For the three wells with data dating back to 1971, the analyses are from at least four different labs, Serco (Apparently 1971-1973), Minnesota Valley Testing (MVT on attached sheets, approximately 1974-1978), Bemidji State University (BSU, 1979-1982), and Minnesota Department of Health (MDH, sampling by MPCA 1978-1979 and 1982).

3. Larry Olson of MPCA, Region III reports that many of the wells are in poor condition--missing caps, depressions on the land surface around some well risers, animal fur in one of the wells, turbidity and rust in many, etc.

4. The only water levels that have been measured apparently were those by Kummer's consultant Gerry Sunde in 1980 (three rounds).

Nevertheless, it is possible to make the following observations:

1. The groundwater sampled by Wells 3, C, E, and F has been degraded in quality by leachate from the landfill. Well 3 is the well shown on Sunde's 1980 plans as "Well C," while the current Well C, since 1980, is located approximately 20 feet farther east and is not shown on Sunde's plan.

9000081

For Wells 3 and F there are data before and after the wells became polluted (the pre-1975 data for Well F are on the Well 3 compilation sheet). The increases in chemical oxygen demand (COD), specific conductance (SC), and chlorides (Cl) and the decrease in pH indicate leachate pollution.

For the current Well C, while there has been only one round of sampling, the well is only about 20 feet away from old Well 3, so it is clear that the degraded water quality in the current Well C is of the same leachate origin as in Well 3.

In Well E there also has been only one sample (by MPCA), but the COD, SC, and apparently also Cl are all elevated above the area background levels established by upgradient Wells H and I.

2. The ground water sampled by the Kummer house well has also been degraded in quality to a lesser extent. The trend is visible only in the increase in SC in the 1978-1982 data compared with the 1974-1978 data.

3. In the other downgradient wells, A, B, G, and J, more data should be obtained before trends can be identified. Apparently Well D has never been sampled.

4. Bruce Wilson of your section has raised concern about apparently high total phosphorous levels in wells at the landfill and at the mobile home park farther east of the landfill. Bruce has previously worked on nutrient loading studies of Lake Bemidji for the Water Quality Division, where "high" phosphorous levels were found in the north basin of the lake. Assuming the levels in the ground water at the landfill were orthophosphate (PO_4), they don't represent any health threat, but conceivably might have some effect on P-loading in the lake.

   I have not evaluated this condition, except to note that both the upgradient concentrations (.080 and .170 mg/L in Wells H and I in January 1982) and downgradient concentrations (.028 to 5.66 mg/L in the other wells) are higher than the median total phosphorous concentrations in the ambient ground water in surficial sand aquifers state-wide (.04 mg/L in 79 samples taken 1978-1981. The mean of these 79 ambient samples was higher, 0.24 mg/L, and the range of the ambient P was large, as was the spread--up to 6.22 mg/L with a standard deviation of 0.93 mg/L .)

   I recommend that someone study the phosphorous data more, try to determine the significance of the landfill as a phosphorous source, and project the phosphorous flux rates and nutrient loading rates associated with probable ground-water flow rates in this area, to see if these rates are unusual or important.

Recommendations

1. Additional sampling of the landfill wells so that wells with zero, one, or two samples have more of a track record.

MAY 24 1982

2. Sampling Wells H, F, C, house, and two additional wells for volatile organics at least once (already accomplished).

3. Get wells properly and permanently field-labeled.

4. Correct well maintenance problems--replace caps, regrade, and divert surface drainage away.

5. Ascertain whether old Well 3 was properly abandoned or simpy bulldozed.

6. Require information on depth of house well and if possible water level elevation.

7. Continue to record condition of water (turbidity, etc.) and if turbid, rusty, or "fur bearing" water is encountered again in Wells B, E, G, I, and J, require replacement of these wells with PVC casings.

8. The total lack of soil borings on the site, except for shallow holes which simply indicated sand to the water table, is unacceptable under present standards. The location, characteristics, and thickness of the "clay" layer inferred to underlie the landfill should be established on the site.

9. The sandy soil, shallow ground water, and elevated specific conductance would make this an ideal site for resistivity surveys to determine the extent of the downgradient plume. Based on this study, it might even be appropriate to install permanent resistivity stations for periodic monitoring of changes in the degraded plume. Other kinds of evaluation of the plume may be appropriate as an alternative, but something more should be done in consideration of downgradient water users.

10. There are no wells downgradient of Well F, which is polluted. Sunde's 1980 measurements indicated ground water flow there was northeastly. A more comprehensive review than I have had time to do should identify whether there are users potentially affected in this direction and whether monitoring farther downgradient to the northeast is needed.

11. Inform Kummer that water elevations must be measured in all on-site wells (not only those sampled) periodically--quarterly for at least one year.

12. The question of final cover should be re-examined--is Kummer capable of or likely to adequately blend sand and organic soil for good vegetation growth? Can parts of the site be final-covered? Are there no better soils available? The current situation, with garbage sitting for a month or more with no cover, and only sand cover and no decent grading on the rest of the site, is sure to promote formation of large volumes of leachate.

cc: Willis Mattison/Larry Olson
Jim Warner/Ken Podpeskar

Well 3*

60325

Date	Analysis by	COD	SC	Cl	pH	Hdns	Fe	Mn	Zn	NO3-
8/4/71[A]				2	7.2					0
9/8/71[A]				6	7.7					2
10/5/71[A]				5	7.7					1
11/3/71[A]				1	7.2					1
12/8/71[A]				1	7.7					1
5/2/73[A]				2.7	7.4					0
11/15/73[A]				3.0	7.5			Well "F"		0
8/8/74	MVT	8.4	260	14.8	7.6					0
11/6/74	MVT	17.6	280	17.0	7.3					0
5/7/75		7.2	450	18.4	7.2					0
						?				
11/4/75[A]		6.0	300	4.6	7.5					0
4/6/76	MVT	26.	250	9.2	7.5			Well "3"		2.
7/6/76	MVT	7.6	240	4.9	7.4					2.
4/5/78[A]		18.0	500	3.6	7.3					1.
6/20/78	MDH[B]	35	1100	45.	6.5[f]	630	1.4	.18	4.5	.
8/10/78	MDH[B]	27	980	28	7.4	560	.5	1.4	2.3	1.
7/17/79[D]	BSU	86.5	1478.1	95.2	7.1					<1
7/20/79	MDH[B]	93[C]	1600	170	7.0		55.	2.2	3.5	-
8/6/79	BSU	78.2	1402	145	7.0	-				10.
5/12/80	BSU	93.9	2013	178	6.9					<1.

abandoned

A = Original data sheets missing (data are from SWIFMS computer data base only).
B = Other parameters also analyzed.
C = T.O.C., not C.O.D.
D = Reported as #2

NOTE: The designator "Well 3" has been used for two or three different wells. The original "Well 3" is the well that was re-named "Well F" by Sunde in 1980. Kummer discontinued using it in 1974 or 1975 and now claims this was done because former MPCA employee "comtaminated" it. The remainder of the data is for the wel Sunde renamed "Well C" in 1980, approximately 600 feet south of "F." A new well "C" was drilled about 20 feet farther east in 1980 when Sunde and Kummer apparent had trouble getting water from the existing well "C."

Kummer House Well (downgradient)

Well "1"

60121

Date	Analysis by	COD	SC	Cl	pH	Hdns	Fe	Mn	Zn	NO
8/4/71[A]				3	6.8					
9/8/71[A]				3	7.7					
3/8/72[A]				2	7.3					
4/12/72[A]				3	7.5					
5/3/72[A]				5	7.3					
6/7/72[A]				25	7.0					
7/11/72[A]				3	7.9					
5/2/73[A]				2	7.5					
11/15/73[A]				2	7.6					
8/8/74	MVT	14.4	300	12.7	7.6					
11/6/74	MVT	4.4	280	17.6	7.2					
5/7/75	MVT	1.6	262	7.4	6.9					
8/4/75[A]		4.0	395	11.3	7.7					
11/4/75[A]		9.0	400	9.9	7.4					
4/6/76	MVT	2.8	280	5.6	7.6					
7/6/76	MVT	3.2	330	5.3	7.5					
4/6/77	MVT	12	395	8.8	7.8					
7/7/77	MVT	3.2	300	5.3	7.6					
4/5/78[A]		37.0	360	4.8	7.4					
4/19/78	MVT	11.6	530	13.8	7.5					
6/20/78	MDH[B]	7	540	6.1	7.4	300	.13	.007	.14	
8/10/78	MDH[B]	<5	580	8.7	7.6	300	<.05	<.02	.13	
7/17/79	BSU	<5	297	<5	7.5					
7/20/79	MDH[B]	<5[C]	530	13	7.5		.18	<.02		
5/12/80	BSU	<5	527	9.3	7.5					
10/2/80	BSU	<5	453	6.1	7.6					<
2/23/81	BSU	<5	555	27.8	7.6					
1/12/82	MDH[B]	<5	560	4.5	7.0[f]	280	<.05	<.02	-	
3/15/82[D]	BSU	5.1	584	7.6	6.8					<
5/4/82	MDH		600	6.0	6.78[f]	300	95	<20	150	
7/7/83		9.8	620	6.3	7.5					<

NOTES: A = Original data sheets missing (data from SWIFMS computer data base only).
B = Other parameters also analyzed.
C = TOC, not COD.
D = BSU data sheet identifies as Well D.
f = Field measured, lab result was higher.

000028

Well "A" (1/4 mile downgradient)

60400

Date	Analysis by	COD	SC	Cl	pH	Hdns	Fe	Mn	Zn	NO_3-N
2/23/81	BSU	<5.0	474	32.0	7.72					<1.0
1/12/82	MDH	1.2	430	1.2	7.0f	250	2.3	.084	-	-
5/4/82	MDH		390	1.5	6.90f	330	2800	120	510	<0.0
7/7/83	MDH	8.7	440	1.9	7.7					<0.02

f = field

Well "B" (downgradient)

60500

Date	Analysis by	COD	SC	Cl	pH	Hdns	Fe	Mn	Zn	NO_3-
2/23/81	BSU	<5.0	426	20.6	7.75					<1.0
1/12/82	MDH	19.	470	4.2	7.0 f	280	5.3	.8	-	-
5/4/82	MDH	--	500	3.3	6.83 f	250	1700	140	890	<0.0
7/7/83	MDH	6.8	490	4.3	7.7					<0.02

f = field

Well "C" (downgradient)

60325

Date	Analysis by	COD	SC	Cl	pH	Hdns	Fe	Mn	Zn	NO_3-N
1/11/82	MHD	180	2000	200	6.8	940	4.2	3.4	-	-
5/4/82	MHD		1400	190	6.55	1100	21,000	4200	15,000	0.84
7/6/83	MHD	120	2200	180	6.9					1.18

NOTE: Apparently installed in 1980 as a replacement for the Well "C" shown on Sunde's 19 plans. This more recent well is about 20 feet east of Sunde's "Well C," or about five feet from the east property boundary. For data from the earlier Well C, whic until 1980 was called "Well 3", see the "Well 3" data compilation sheet.

Well "E"

60900

Date	Analysis by	COD	SC	Cl	pH	Hdns	Fe	Mn	Zn	NO_3-N
1/12/82	MHD	110	920	9.8	7.0f	500	63*	0.8*	-	-
5/4 '82	MHD	—	1000	2.9	6.86f	620	18000	330	1400	0.10
7/6/83		13	920	22	7.4					0.07

f = field

* Results probably not accurate for metals because of apparent acidification sediment in analyses (see Well J lab data)

Well "F" (downgradient)

60600 Note: See also 1971-1975? Data on the "Well 3" compilation sheet.

Date	Analysis by	COD	SC	Cl	pH	Hdns	Fe	Mn	Zn	NO_3-N
1/12/82	MDH	110	1400	75	7.0	620	18.0	.29	-	-
3/15/82	BSU	99.2	1473	157	6.6f					<1.01
5/4/82	MHD	—	1300	87	6.8f	550	21000	300	930	3.14
7/7/83	MHD	67	1200	55	7.1					2.43

NOTE: This is the original well "3" used by Kummer during approximate period 1971-1975. In about 1975, he replaced it with another "Well 3", later renamed well "C" by Sur in 1980, because, he now alleges, a former employee of MPCA "contaminated" Well F. For 1971-1975 data from Well F see the "Well 3" compilation sheet. It was not sampled approximately 1975-1981.

000034

Well "G" (downgradient or lateral/downgradient)

60700

Date	Analysis by	COD	SC	Cl	pH	Hdns	Fe	Mn	Zn	NO_3-N
1/12/82	MDH	26.	360	1.2	6.9^f	200	2.9	.24	-	-
3/15/82	BSU	36.5	433	3.47	7.3					1.14
5/4/82	MDH		370	2.6	~~6.81~~ 6.88^f	180	2200	120	3200	0.06

f = field

Well "H" (upgradient)

Called "Well 2" at least prior to 1980

60223

Date	Analysis by	COD	SC	Cl	pH	Hdns	Fe	Mn	Zn	NO_3-N
8/4/71[A]				2	7.2					0
9/8/71[A]				6	7.7					2
10/5/71[A]				5	7.7					1
11/3/71[A]				1	7.2					1
12/8/71[A]				1	7.7					1
1/3/72[A]				3.7	7.1					3
8/8/72[A]				3.0	7.5					2
9/6/72[A]				5.0	7.1					1
10/12/72[A]				4.0	7.5					1
11/8/72[A]				3.0	7.7					1
5/2/73[A]				1.6	7.3					1
11/15/73[A]				3.0	7.6					1
1/5/74[A]				6.0	7.5					3
8/8/74	MVT	10.8	250	13.4	7.5					1.2
11/6/74	MVT	6	230	12.	7.4					0
5/7/75	MVT	0.8	260	6.	7.4					0
8/4/75[A]		17.0	290	10.2	7.7					0
11/4/75[A]		8.0	345	7.4	7.5					0
4/13/76	MVT	2.8	280	7.8	7.3					1.5
7/6/76	MVT	3.6	230	5.6	7.9					1.2
4/8/77	MVT	9.6	250	4.6	7.5					<1
7/7/77	MVT	14.8	55	15.6	7.5					3.2
4/5/78[A]		35.0	415	4.2	7.3					2.0
4/19/78	MVT	2.4	280	4.6	-					<1
6/20/78	MDH[B]	<5	340	.50	7.3	170	.20	<.02	.14	.46
8/10/78	MDH[B]	6	380	.61	7.6	201	.11	<.02	.38	.44
7/17/79[D]	BSU	<5	515	<5	7.4					
7/20/79E	MDH[B]	2.5[C]	330	4.3	7.7		.63	<.02	.33	-
5/12/80	BSU	<5	276	2.48	7.6					1.12
10/2/80	BSU	<5	302	2.29	7.6					4.01
2/23/81	BSU	<5	351	16	7.8					<1.01
1/11/82	MDHB	20	320	<.05	7.2[f]	170	.48	<.02	-	-
3/15/82	BSU	14.11	590	9.82	7.0					<1.01
5/4/82	MDH		330	<0.5	7.06[f]	160	190	<20	150	<0.0
7/6/83	MDH	<5.0	350	0.60	7.7					0.0

NOTES: A = Original data sheets missing (data from SWIFMS computer data base only).
B = Other parameters also analyzed.
C = TOC, not COD.
D = Reported as Well #3.
E = Reported as Well 1-upstream.
f = Field measurement

Well "I" (upgradient)

61000

Date	Analysis by	COD	SC	Cl	pH	Hdns	Fe	Mn	Zn	NO_3-N
1/11/82	MDH	11	440	<0.5	7.2f	240	5.5*	.35*	-	-
5/4/82	MDH		380	0.77	6.8f	220	4500	190	1900	<0.02
7/6/83	MDH	<5.0	300	0.51	7.7					<0.02

f = field
* Results may not be accurate for metals (see Well J lab data sheet)

Well "J"

61300

Date	Analysis by	COD	SC	Cl	pH	Hdns	Fe	Mn	Zn	NO_3-N
1/12/82	MHD	42	570	6.8	6.9^f	310	24*	.49*	-	-
5/4/82	MDH		600	7.4	6.76^f	330	8600	160	560	<0.02
7/6/83	MDH	5.7	740	10	7.5					0.02

f = field

* Results may not be accurate for metals (See lab data sheet)

APPENDIX A-2

LIST OF PRIVATE WELLS SAMPLED

MALCOLM PIRNIE

November 8, 1984

PRIVATE WELLS SAMPLED - NORTHERN TOWNSHIP

Name	Address	Sample #	Sample Date	MDH Adv.	MDH Notice	MPCA Ltr. W/Results
D. Sovde	3703 Cedar Lane	130522	5-23-84		X	X
-send notice to	3817 Waville Rd. NE	132233	6-11-84			
M. Westrum	3707 Cedar Lane	130523	5-23-84		X	X
		132234	6-11-84			
W. Axvig	3612 Cedar Lane	130524	5-23-84		X	X
		132236	6-11-84			
L. Pierce	900 Anne St.	130525	5-23-84			X
		132235	6-11-84	X		
TV Station	726 Anne St.	130526	5-23-84			
Y. Teeters	4203 Irvine	130521	5-23-84		X	X
		132237	6-11-84			
C. Maus	3711 Cedar Lane	132243	6-11-84		X	X
M. Field	3609 Cedar Lane	13244	6-11-84			X
M. Moberg	3511 Cedar Lane	13245	6-11-84			X
J. Peterson	3405 Cedar Lane	132246	6-11-84			X
Wm. Elliot	3514 Cedar Lane	132247	6-11-84			X
		130583	7-5-84		X	
H. Elliot	3709 Irvine Ave. NW	132238	6-11-84			X
		130584	7-5-84	X		
C. Kummer	901 Anne St. NW	132239	6-11-84			X
		130575(deep)	7-5-84		X	
NW Mech. Service	3516 Irvine	132240	6-11-84			X
c/o Bernard Nielson		130569	7-5-84		X	
Bill's Self Service	3426 Irvine	132241	6-11-84			X
		130570	7-5-84		X	
Joan Wright-Goransen	4126 Irvine Ave. NW	132242	6-11-84			X
-send notice to	1016 Balsam Rd. NW	130578	7-5-84	X		
G. Nicol	3515 Cedar Lane	130560(deep)	7-5-84			X
		130561(shallow)				

Name	Address	Sample #	Sample Date	MDH Adv.	MDH Notice	MPCA Ltr. W/Results
NON-RESPONSIVE [redacted]		130562	7-5-84			X
		130563	7-5-84	X		X
		130571	7-5-84			X
		130572	7-5-84			X
		130573	7-5-84		X	X
		130574	7-5-84			X
		130576	7-5-84	X		X
		130577	7-5-84	X		X
		130585	7-5-84			X
		130586	7-5-84	X		X
		130579	7-5-84			X
		130580	7-5-84		X	X
		130581	7-5-84			X
		130582	7-5-84			X
		130565	7-5-84			X
		130566	7-5-84			X
		130567	7-5-84			X
		130568	7-5-84			X
		130607	7-25-84			X
		130608	7-25-84			X
		130609	7-25-84			X
		130610	7-25-84			X

Name	Address	Sample #	Sample Date	MDH Adv.	MDH Notice	MPCA Ltr. W/Results
NON-RESPONSIVE [redacted]		130611	7-25-84			X
		130613	7-24-84			X
		130614	7-25-84			X
		130616	7-25-84			X
		130615	7-25-84			X
						X
		130617	7-25-84			X
		130618	7-25-84			X
		130612	7-25-84			
		130619	7-26-84			X
		130620	7-26-84			X
		130621	7-26-84			X
		130622	7-26-84			X
		130624	7-26-84			X
		130625	7-26-84			X
		130626	7-26-84			X
		130627	7-26-84			X
		30688	10-9-84			
		30689	10-9-84			
		30690	10-9-84			
		30691	10-9-84			

NON-RESPONSIVE

Name	Address	Sample #	Sample Date	MDH Adv.	MDH Notice	MPCA Ltr. W/Results
[redacted]		30692	10-9-84			
		30687	10-9-84			
		30684	10-9-84			
		30685	10-9-84			
		30686	10-9-84			
		30683	10-9-84			

DRAFT

APPENDIX A-3

HISTORY OF RESPONSE ACTIONS

- April 26, 1971: MPCA issued permit SW-31 to construct and operate a landfill to Charles Kummer. Site opened in 1971.

- July-August 1971: Monitor Wells 1, 2 and 3 installed and sampled by owner.

- April , 1972: SERCO Laboratories collected samples from wells at landfill.

- July 20, 1972: MPCA began inspections of landfill -- noted violations of Minnesota Rules.

- March 6, 1979: MPCA issued a notice of noncompliance.

- May 15, 1979: MPCA issued Notice of Violation for failure to comply with MPCA Rule SW-6.

- December 18, 1979: Stipulation agreement with permittee.

- 1980: Stipulation agreement concerning permit to operate site. Permittee required to prepare a geotechnical report for the site.

- April 19, 1983: Legal action commenced by state for violation of MPCA solid waste and water quality rules, MN Environmental Rights Act, and the Stipulation Agreement.

- May 4, 1982: Sampled MPCA monitor wells revealing 19 VOC in downgradient wells.

- July 7, 1983: Sampled MPCA monitor wells revealing 19 VOC in downgradient wells.

- October 4, 1983: MPCA sampled monitor wells revealing 19 VOC in downgradient wells.

- November 16, 1983: MPCA inspected site, found violations.

- January 27, 1984: MPCA inspected site and found continuing violations.

- February 15, 1984: MPCA inspected site and found continuing violations.

- March 23, 1984: MPCA inspected site and found continuing violations.

- April 30, 1984: MPCA inspected site and found continuing violations.

DRAFT

- May 23, 1984: MPCA sampled shallow home wells revealing numerous organic compound -- 14 of which were found in Kummer monitor well water quality analyses.

- June 11, 1984: MPCA sampled shallow home wells revealing numerous organic compound -- 14 of which found in Kummer monitor well water quality analyses.

- July 5, 1984: MPCA sampled shallow home wells revealing numerous organic compound -- 14 of which found in Kummer monitor well water quality analyses.

- June 20, 1984: MPCA inspected site, found continuing violations.

- June 26, 1984: The MPCA issued a Request for Response Action to the Permittee, Ruth Kummer and Jon Kummer, under the Minnesota Environmental Response and Liability Act, Minn. Stat. Ch. 115B, which requested the Permittee to undertake a Remedial Investigation/Feasibility Study at and around the landfill,to delete appropriate remedial action plans, develop and implement long-term ground water monitoring plans, and development a site closure plan.

- August 1, 1984: Permittee informed the MPCA staff that he was unable to conduct the activities requested in the Request for Response Action and that he would voluntarily close the Landfill.

- August 28, 1984: MPCA issued a Determination of Inadequate Response to the Permittee for his failure to conduct the activities requested in the Request for Response Action.

- October 1, 1984: The Permittee ceased to accept any waste at the Landfill except for demolition debris which was to be used to fill holes and depressions to facilitate closure activities at the Landfill.

- October 8, 1984: MPCA inspections identified continuing violations of the Stipulation Agreement and the MPCA solid waste rules.

- November 8, 1984: MPCA inspections identified continuing violations of the Stipulation Agreement and the MPCA solid waste rules.

- November , 1984: Last waste admitted to landfill.

- April 1, 1985: MPCA staff was informed by the MPCA's Detroit Lakes regional office that the Permittee had reopened the Landfill and was willing to accept mixed municipal solid waste.

- April 4, 1985: Beltrami County attorney obtained a on the Permittee to prevent the disposal of solid waste at the Landfill.

DRAFT

- June 25, 1985: MPCA issued order to close landfill and conduct monitoring.

- July , 1985: MPCA awarded contract to Malcolm Pirnie begin RI/FS of the Kummer landfill under provisions of the CERCLA & ERLA.

CHAPTER 3

SITE SAFETY PLAN

KUMMER SANITARY LANDFILL

NORTHERN TOWNSHIP, BELTRAMI COUNTY
MINNESOTA

APRIL, 1986

MALCOLM PIRNIE

3.0 General

As a minimum, all project personnel involved with site investigations including boring, well installation, geotechnical surveys, sampling, etc., will perform project work in accordance with the procedures outlined and/or referenced in this Site Safety Plan. The following guidelines to protect the health and safety of on-site personnel and limit exposure of the public to potentially hazardous conditions, substances, or contaminants will be adhered to:

A. Section III (c) (6) of CERCLA

B. OSHA Requirements (29 CFR 1910 and 1926)

C. Standard Operating Safety Guide, (Revised November, 1984) by the U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division.

In the event of conflicting plans or requirements, personnel must implement those safety practices which afford the highest personnel protection.

If site conditions change and it is necessary to modify Levels of Protection A, B, or C, the Safety Officer or the on-site safety designee may upgrade the level of protection as warranted. The Project Manager and Site Manager shall be informed of this revision as soon as practical by the Safety Officer.

3.1 Key Personnel and Their Safety-Related Functions

3.1.1 Project Manager: Terry Ritter

The Project Manager is responsible for maintaining a clear definition of an adherence to scope, schedule, and budget. He will provide overall direction for the implementation of field activities in accordance with this plan. He is to monitor operations at the site to assure that exposures are minimized. Incident reports and questions are to be directed to this individual.

3.1.2 Project Safety Officer: Peter Cangialosi

The Safety Officer is responsible for development of health and safety guidelines and for determining that project personnel are adequately trained to perform their project duties in a safe and efficient manner. He will audit safety procedures employed at the site. The Safety Officer may designate on-site personnel to carry out safety related functions. The Safety Officer or the safety designee on-site are authorized to direct any project member to stop work if safety requirements are not being met.

3.1.3 Site Manager: James Pennino

The Site Manager has the responsibility of conducting field work and implementing safety procedures as described herein on a day-to-day basis. He is responsible for calling off work if adverse weather conditions affect the safety of project personnel. The Site Manager is also authorized to direct any staff member to stop work if safety requirements are not being met. He will be in charge during any emergency. The person assigned as Site Manager may vary depending on the particular site activities under way. The Site Manager will conduct a meeting with field personnel each day of field activities to designate responsibilities and coordinate work.

Telephone Numbers

		Office	Home
Project Manager	- Terry Ritter	(201) 845-0400	[redacted]
Safety Officer	- Peter Cangialosi	(612) 481-4690	
Site Manager	- James Pennino	(612) 481-4670	

3.2 Known Hazards and Risks

Hazards and health risks related with project work are associated with the presence of chlorinated hydrocarbons found in ground water obtained from potable and monitoring wells in Northern Township. These include the parameters listed in Table 3-1. Because these include suspected carcinogens, the Minnesota Department of Health advised private well owners within the affected area to discontinue use of their wells for potable purposes.

Specific risks to project personnel arise from the volatilization of the identified hydrocarbons from contaminated media (ground water and soil) within close proximity to project personnel. Such volatilization may result from disturbance of subsurface soils and ground water during drilling and sampling activities.

TABLE 3-1

VOLATILES FOUND IN GROUND WATER

Methylene Chloride	Dichlorodifluoromethane
1,1-Dichloroethane	Acetone
cis 1,2-Dichloroethylene	Ethyl Ether
1,1,2-Trichloroethylene	Benzene
Trichlorofluoromethane	Toluene
1,1-Dichloroethylene	Total Xylenes
1,2-Dichloropropane	Tetrahydrofuran
Vinyl chloride	Ethyl Benzene
Chloromethane	1,1,2,2-Tetrachloroethylene
Dichlorofluoromethane	Chloroform
Bromomethane	Chloroethane
1,2-Dichloroethane	1,1,2,2-Tetrachlorethane
1,1,1-Trichloroethane	

It is not anticipated, though, that ambient concentrations of the hydrocarbons will present significant health risks due to the low concentrations present and dilution effects following volatilization. Appropriate levels of protection will be maintained to adequately protect the health of on-site workers. These levels are described further in the next section, Prescribed Levels of Protection.

3.3 Prescribed Levels of Protection

3.3.1 Field Operations:

- Level D

3.3.2 Provision For Adjusting Level of Protection:

- Air monitoring with OVA and/or HNu meters will be conducted during activities which disturb subsurface soils. Adjustments to the prescribed level of protection may be considered based on the meter dial readings as indicated below:

Nonmethane Dial Reading	Level of Protection
1. Background	D
2. Background to 5 ppm above background	C

Nonmethane Dial Reading	Level of Protection
3. 5 ppm above background to 500 ppm above background	B
4. Greater than 500 ppm background	A

Meter readings alone will not dictate changes in the level of protection. In addition to professional judgement, other items will be considered.

These include:

1. Visual observations of drill cuttings (subsurface soils)

2. Evaluation of the risks associated with higher levels of protection (vision interference, loss of agility, added stress and fatigue, etc.)

3. Weather considerations

4. Nature of activities planned

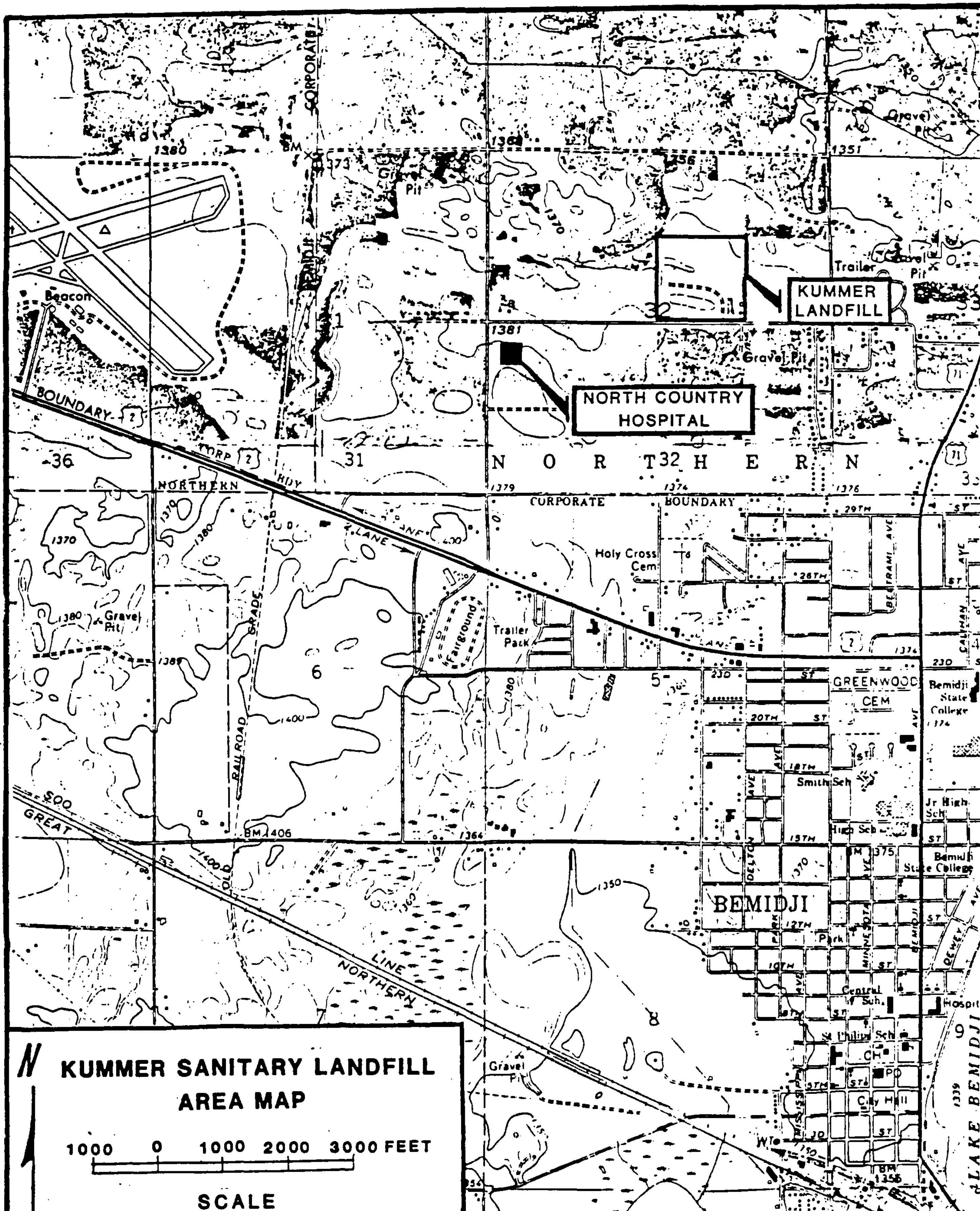
Based on these considerations, the Site Manager may recommend to the Safety Officer adjustment of the prescribed level(s) of protection. After conferring with the Project Manager, the Safety Officer may adjust the prescribed level of protection.

3.4 Work Zones

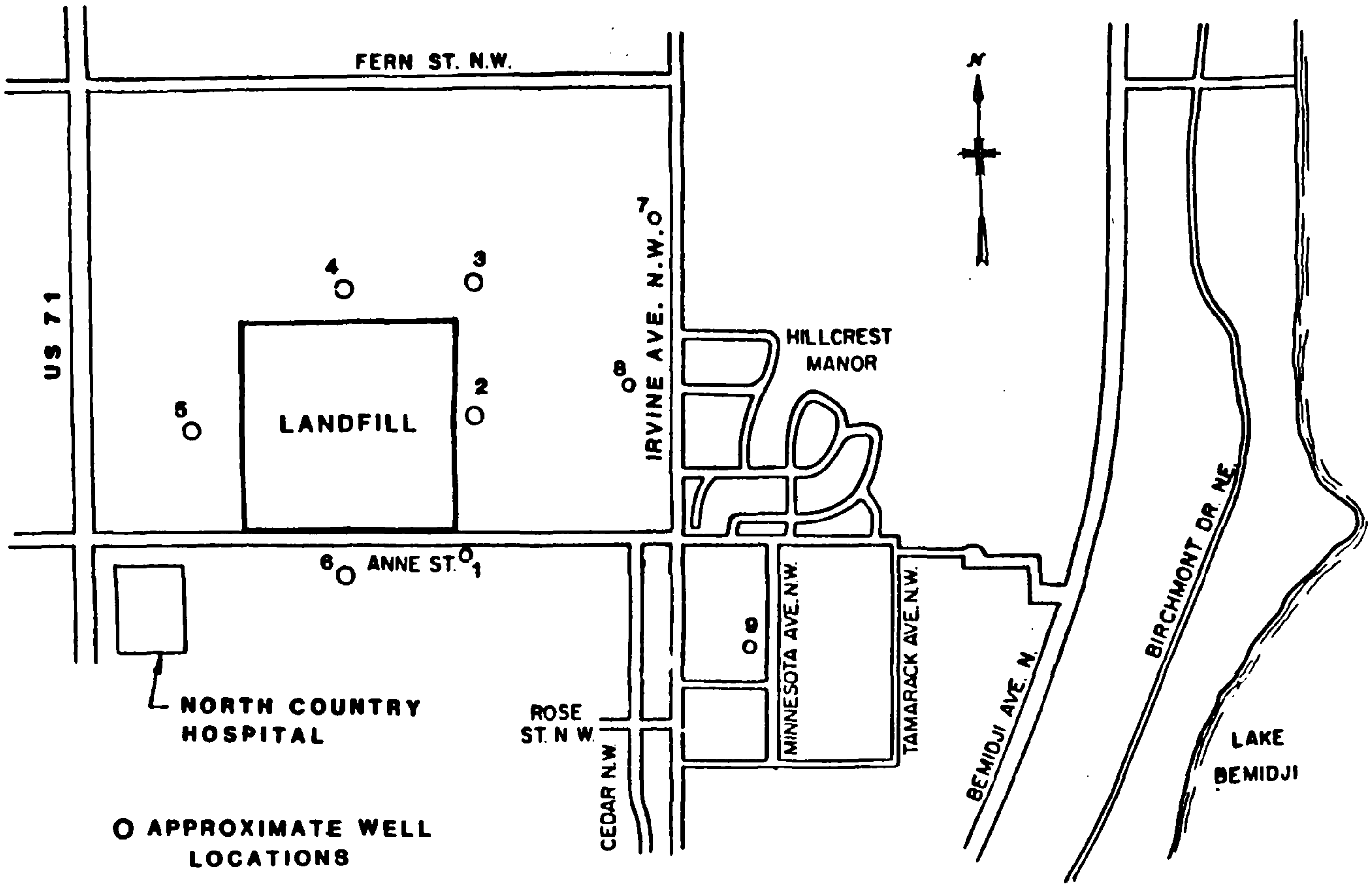
Typically, work zones are established at hazardous waste sites to minimize transport of hazardous substances by site activities. Work zones usually take the form of concentric areas including the exclusion zone (innermost), the decontamination zone, and the support zone (outermost). Access between zones is limited by control points. However, investigative activities will be taking place at a number of separate locations both on and off the landfill property. Therefore, a single, area-wide exclusion zone is not appropriate.

The site is located approximately one mile west of Lake Bemidji on Ann Street NW in Northern Township, Beltrami County as shown on Figures 3-1 and 3-2. Access to the landfill is via a private dirt road from Anne Street NW. Proposed monitoring wells and sample points are accessible via area roadways and, in some cases, through private properties.

FIGURE 3-1


KUMMER LANDFILL
NORTH COUNTRY HOSPITAL
BEMIDJI
Beacon
Gravel Pit
Trailer Park
Fairground
Holy Cross Cem
GREENWOOD CEM
Bemidji State College
Smith Sch
Jr High Sch
High Sch
Central Sch
City Hall
NORTHERN CORPORATE BOUNDARY
SOO LINE
GREAT NORTHERN
LAKE BEMIDJI
KUMMER SANITARY LANDFILL
AREA MAP
1000 0 1000 2000 3000 FEET
SCALE

KUMMER SANITARY LANDFILL
NORTHERN TOWNSHIP



LANDFILL LOCATION AND WORK AREA

3.5 Controlling Site Access

Due to the size and nature of the study area, controlling site access will be limited to minimizing access to individual work areas. The Site Manager will be responsible for maintaining procedures to prevent unauthorized personnel (as determined by him) from entering work zones and all personnel from entering work zones without the prescribed level of protection.

3.6 Decontamination Procedures

Detailed decontamination procedures are outlined in Standard Operating Procedure No. 10 which immediately follows this plan. The Site Manager in consultation with the Safety Officer may modify decontamination procedures in SOP 10 as warranted to reflect site-specific conditions.

3.7 Emergency Procedures

Part of the overall planning for on-site investigations is managing medical emergencies. Thus, the following emergency procedures will be provided for:

- All team members will review this site Safety Plan.
- Arrangements with the nearest medical facility for transportation and treatment of injured, and for treatment of personnel suffering from exposure to chemicals.
- Consultation services with a toxicologist.
- Emergency eye washes.
- First aid kits.

It may be necessary to transport personnel with medical problems or injuries off-site. In this case decontamination may have to be modified or omitted if there is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt life-saving first aid and/or medical treatment is required, decontamination procedures should be omitted. Whenever possible, project personnel should accompany contaminated victims to the medical facility to advise on matters involving decontamination.

A. Emergency First Aid

Emergency first aid treatment is only administered as a means of providing relief from injury and preventing further damage until professional treatment can be obtained. The following first aid equipment shall be provided at the site:

- American National Red Cross First Aid Handbook
- Compresses
- Gauze and gauze roller bandage
- Triangular bandages
- Eye dressing packet
- Smelling salts
- Baking soda
- Salt or other emetic (syrup of ipecac)
- Eye wash
- Soap or waterless hand cleaner and towels
- Band aids
- Tape
- Scissors
- Tweezers
- Water

The following emergency first aid shall be administered as required.

B. Physical Injury

Physical injuries can range from a sprained ankle to a compound fracture, from a minor cut to massive bleeding. Depending on the seriousness of the injury, treatment may be given at the site by trained response personnel. For more serious injuries, additional assistance may be required at the site or the victim may have to be treated at a medical facility.

Life-saving care should be instituted immediately without considering decontamination. The outside garments can be removed (depending on the weather) if they do not cause delays, interfere with treatment, or aggravate the problem. If the outer contaminated garments cannot be safely removed, the individual should be wrapped in plastic, rubber, or blankets to help prevent contaminating the inside of ambulances and/or medical personnel. Outside garments are then removed at the medical facility. No attempt should be made to wash or rinse the victim. One exception would be if it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life. For minor medical problems or injuries, the normal decontamination procedure should be followed.

C. Chemical Exposure

Exposure to chemicals can be divided into two categories:

- Injuries from direct contact with leachate or inhalation of toxic gases

- Potential injury due to gross contamination on clothing or equipment

For the inhaled contaminant, treatment can only be performed by a qualified physician. If unconscious, the victim should be pulled from the contaminated area immediately. Rescuers must wear appropriate respiratory and protective equipment. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract the substance's effect. First aid treatment usually involves flooding the affected area with water; however, for a few chemicals, water may cause more severe problems.

D. Ingestion

Should toxic materials be ingested, vomiting will be induced using a tablespoon of salt or powdered mustard in a glass of warm water or syrup of ipecac except when the ingested substance presents an aspiration hazard, such as from a petroleum product; or when the substance is a strong acid or alkali. Vomiting may also be induced by placing a finger down the throat of the victim. Treatment should continue until vomit is clear.

E. Incident Reports

In the event of injury or exposure to any field personnel, the Site Manager will be responsible for the preparation and submission of an Incident Report. The Project Leader will be required to follow up on treatment and recovery as required. A sample Incident Report is presented on the following page as Figure 3-3.

F. Emergency Contacts

Fire	218-751-8001	(Bemidji)
Ambulance	218-751-3323	(Bemidji)
Hospital	218-751-5530	(North Country Hospital)
Police	218-751-9111	(Beltrami County Sheriff)

Nearest Phone: Kummer residence on southeast corner of landfill property (Ann Street NW).

Other Nearby Phones:

1. Residence immediately west of landfill on Ann Street NW.
2. North Country Hospital southwest of landfill across Ann Street NW.

FIGURE 3-3

MALCOLM PIRNIE, INC.

INCIDENT REPORT

Project______________________ Health & Safety Mgr.________________

Site Location________________ Project Mgr.________________________

Incident Summary____

____

____

Date and Time of Incident____

Exposed Individuals____

____

____

Exposed to____

____

Actions Taken:

First Aid Administered
Doctor Examination
Other____

____

____

____

3. Television station directly east of Kummer residence.

Nearest Hospital: Hospital directly southwest of landfill across Anne Street NW (within 1,000 feet of landfill, see Figure 3-1)

3.8 Training

Hazardous waste site investigations, by their very nature, require precautions to reduce risks of health hazards, injuries and death to project personnel. Clearly every safety hazard associated with the Kummer landfill cannot be anticipated; and accordingly, rules cannot be developed for every contingency that could arise. However, in order to minimize risks, instruction on the use of appropriate safety equipment which stresses the necessity for strict adherence to basic rules of safety standard operating procedures at hazardous waste sites is given to project personnel prior to commencement of project work. The application of common sense and technical judgment are also heavily emphasized.

Specifically, personnel are instructed in the hazards posed by chemicals. The proper choice and implementation of personal safety practices, procedures, and equipment are discussed. This includes instruction on how to use various measuring devices, respiratory protection apparatus, protective clothing, and safety equipment. Operational considerations are also discussed such as the development and use of a field sampling plan. All project personnel are required to be familiar with this site safety plan.

Field personnel will be knowledgeable beforehand of the team's and their own personal objectives in conducting field investigation tasks. Prior planning of field activities will ensure a smoother and more efficiently run investigation in which the generated data will be directly used in later phases of the overall project. These would include feasibility studies and the conceptual design of remedial measures.

The Work Plan will be reviewed by each team member. Each member involved must know the purpose and objectives of the work they are conducting have basic information on:

- Nature of materials present at the site including:
  - Chemicals, their properties and potential hazards
  - Form of wastes (solids, liquids, vapors, etc.)

- Physical description of the site, its location, size, topography, and natural and man-made features

- Description of surrounding area, including surface waters, location of public drinking water supplies, proximity of residences, possible public exposure

- Health and Safety procedures

3.9 Respiratory Protection

All personnel involved with on-site activities will be familiar with the use of respiratory protection and will be properly trained in their use. All respirators will be properly decontaminated at the end of each workday.

Persons having beards or facial hair must not wear a respirator if a proper mask-to-face-seal cannot be demonstrated by a fit test.

3.10 Medical Monitoring

All project personnel who are exposed to hazardous levels of chemicals must be enrolled in a medical monitoring program.

3.11 *General Safety Rules and Equipment*

A. There will be no eating, drinking, or smoking in the exclusion or contamination reduction zone.

B. All personnel must pass through the contamination reduction zone to enter or exit the exclusion zone.

C. As a minimum, emergency eye washes will be on the hot side of the contamination reduction zone and/or at the work station.

D. At the end of the work day, all personnel working in the exclusion area shall take a hygienic shower.

E. All supplied breathing air shall be certified as Grade D or better.

F. Where practical, all tools/equipment will be spark- proof, explosion resistant, and/or bonded and grounded.

G. An adequately stocked first-aid kit will be on-scene at all times during operational hours. It is suggested that an oxygen inhalator respirator be available and a qualified operator present. The location of these items and the operator shall be posted.

1.0 OBJECTIVE

This guideline outlines the steps and equipment needed for the decontamination of reusable personal protection and field sampling equipment.

2.0 APPLICABILITY

The guideline is applicable to the field decontamination of protective and other equipment used on hazardous substance sites to prevent the spread or transfer of these materials into clean areas or away from the site.

3.0 DEFINITIONS

Exclusion zone--The area of potential contamination.

Contamination reduction zone (CRZ)--The area located between the exclusion zone and the support zone, where all decontamination takes place.

Contamination reduction corridor (CRC)--The area within the CRZ for control of access into and out of the exclusion zone.

Support zone--Comman post and noncontaminated area.

Figure 10-1 shows a typical layout of the zones define above.

4.0 GUIDELINES

Transfer of hazardous materials to equipment and personnel working at sites is almost a certainty. Personnel are protected by clothing and other gear while at the site, but this gear must be removed when leaving the site. To restrict the migration of hazardous materials from the site, all clothing and equipment must be decontaminated.

The need for personnel decontamination can vary greatly. Operations such as walking through an area may require only a simple controlled undressing procedure and bagging of contaminated clothing. In operations in which extensive work is performed in a contaminated area, gross contamination of protective clothing and equipment can occur. In these cases, a controlled undressing and bathing facility will be needed.

For those situations in which gross contamination may occur, a sophisticated contamination reduction zone as illustrated in Figure 10-1 should be established. It provides for a controlled undressing and washing system that is designed to avoid transfer of chemical contamination from protective clothing. The number of stations can be adjusted to the protective clothing system being used. All field personnel should shower as soon as possible after leaving a contaminated area.

Similarly, all field equipment that is not disposable must be cleaned for reuse. Two purposes are served: (1) to prevent cross contamination of samples and (2) to eliminate offsite transport of hazardous substances.

4.1 RESPONSIBILITIES

The field team leader has overall responsibility for implementation of decontamination procedures. Decontamination personnel assigned specifically to the project are responsible for the decontamination operations.

4.2 EQUIPMENT

The following equipment is needed for decontamination operations:

1. Barrels or containers for rinse water and equipment drops
2. A water-spraying device, such a 5-gal stirrup pump or garden sprayer
3. Brushes and detergents to aid the cleaning operation
4. Towels of Kimwipes
5. Enough plastic bags to double-bag all disposable items
6. Assortment of chemical decontaminants (e.g., detergent, caustic, N-con spray, Alconox, calcium hypochlorite solution, and a solution of 5 percent trisodium phosphate plus 5 percent sodium carbonate)
7. Solvents (if shippable)
8. Buckets, tray, pales
9. Assorted lumber, canvas, rope, etc.
10. Shower facility (optional)
11. Benches, chairs
12. Water-heating equipment, where appropriate (steam generators may be useful in cleaning large pieces of equipment)
13. Soap, shampoo, etc.
14. Sandbox or plastic swimming pool
15. Plastic ground sheet

4.3 DECONTAMINATION

4.3.1 Procedure for Full Decontamination

The decontamination procedure described below is the full decontamination process used for a level A decontamination. Decontamination procedures used for levels A, B, and C are showing figures 10-2, 10-3 and 10-4.

At the completion of onsite activities, or for self-contained breathing apparatus tank change, personnel are to proceed to the contamination reduction corridor.

Station 1: Segregated Equipment Drop

Deposit equipment used on the site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross contamination.

The following equipment is necessary:

- Containers of various sizes
- Plastic liners
- Plastic drop cloths

Station 2: Boot Cover and Glove Wash

Scrub outer boot covers and gloves with decontamination solution (see Section 4.3.2 below) or detergent/water solution.

The following equipment is necessary:

- Container (20 to 30 gal)
- Decontamination solution
- Detergent/water solution
- Two or three long-handled, soft-bristle scrub brushes

Station 3: Boot Cove and Glove Rinse

Rinse off decontamination solution from Station 2 using copious amounts of water. repeat as many times as necessary.

The following equipment is necessary:

- Container (30 to 50 gal)
- High-pressure spray unit
- Water

Two or three long-handled, soft-bristle scrub brushes

Station 4: Tape Removal

Remove tape around boots and gloves and deposit in container with plastic liner.

The following equipment is necessary:

Container (20 to 30 gal)
Plastic liners

Station 5: Boot Cover Removal

Remove boot covers and deposit in container with plastic liner.

The following equipment is necessary:

Container (30 to 50 gal)
Plastic liners
Bench or stool

Station 6: Outer Glove Removal

Remove outer gloves and deposit in container with plastic liner.

The following equipment is necessary:

Container (20 to 30 gal)
Plastic liners

Station 7: Suit/Safety Boot Wash*

Thoroughly wash protective suit and boots. Scrub suit, boots, and self contained breathing apparatus (SCBA) or canister/mask if applicable with long-handled, soft-bristle scrub brush and copious amounts of decontamination solution or detergent/water solution. Repeat as many times as necessary.

The following equipment is necessary:

Container (30 to 50 gal)
Decontamination solution
Detergent/water solution
Two or three long-handled, soft-bristle scrub brushes

Station 8: Suit/Safety Boot Rinse*

Rinse off decontamination solution or detergent/water solution using copious amounts of water. Repeat as many times as necessary.

The following equipment is necessary:

Container (30 to 50 gal)
High-pressure spray unit
Water
Two or three long-handled, soft-bristle scrub brushes

Station 9: Tank Change*

If leaving the exclusion zone to change air tank (canister/mask), this the last step in the decontamination procedure. Exchange air tank (canister/mask), don new outer gloves and boot covers, and tape joints. Then return to duty.

The following equipment is necessary:

Air tanks
Tape
Boot covers
Gloves

Station 10: Safety Boot Removal

Remove safety boots and deposit in container with plastic liner.

The following equipment is necessary:

Container (30 to 50 gal)
Plastic liners
Bench or stool
Boot jack

---

*For Level B, include self-contained breathing apparatus; for level C, include canister/mask.

*For level C, include canister/mask change.

Station 11: Protective Suit and Hard-Hat Removal

With assistance of helper, remove protective suit and hard hat. Hang suit on rack or lay out on drop cloths.

The following equipment is necessary:

Rack
Drop cloths
Bench or stool

Station 12: SCBA Backpack Removal

While still wearing facepiece, remove backpack and place on table. Disconnect hose from regulator valve and proceed to next station.

A sturdy table is required.

Station 13: Inner Glove Wash

Wash with decontamination solution or detergent/water solution that will not harm skin. Repeat as many times as necessary.

The following equipment is necessary:

Basin or bucket
Decontamination solution
Detergent/water solution
Small table

Station 14: Inner Glove Rinse

Rinse with water. Repeat as many times as necessary.

The following equipment is necessary:

Water
Basin or bucket
Small table

Station 15: Facepiece Removal

Remove facepiece. Deposit in container with plastic liner. Avoid touching face with fingers.

The following equipment is necessary:

Container (30 to 50 gal)

Plastic liners

Station 16: Inner Glove Removal

Remove inner gloves and deposit in container with plastic liner.

The following equipment is necessary:

Container (20 to 30 gal)
Plastic liners

Station 17: Inner Clothing Removal

Remove inner gloves and deposit in container with plastic liner.

The following equipment is necessary:

Container (20 to 30 gal)
Plastic liners

Station 17: Inner Clothing Removal

Remove clothing soaked with perspiration. Place in container with plastic liner. Do not wear inner clothing off the site, since there is a possibility that small amounts of contaminants have been transferred in removing protective suit.

The following equipment is necessary:

Container (30 to 50 gal)
Plastic liners

Station 18: Field Wash

Shower if highly toxic, skin-corrosive, or ski-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.

The following equipment is necessary:

Water
Soap
Small table
Basin or bucket
Field showers
Towels

Station 19: Redress

Put on clean clothes. A dressing trailer is needed in inclement weather.

The following equipment is necessary:

Tables
Chairs
Lockers
Clothes

In the case of level B or C protection, some of the decontamination stations described above may be omitted as outlined in Table 10-1.

4.3.2 Decontamination Solutions

For decontamination purposes, several solutions may be used. One is a solution containing 5 percent sodium carbonate (Na_2CO_3) and 5 percent trisodium phosphate (TSP) (Na_3PO_4). (Mix 4 lb of commercial grade TSP and 4 lb of sodium carbonate (soda ash) with each 10 gal of water.) These chemicals are available at most hardware stores. Other decontaminating solution are outlined in Table 10-2

A single solution cannot be used for decontamination because in many cases the onsite contaminants will not be known or there will be many contaminants encountered.

4.4 RECORDS

The following information is to be recorded in the field logbook:

1. Name and location of job

2. Time site was entered, duration of stay, and time site was left (for each team member)

3. Weather conditions and other pertinent information

4. Level of protection used

5. Decontamination steps used

6. Specific decontamination solution(s) used

CHAPTER 4

SITE SECURITY PLAN

KUMMER SANITARY LANDFILL

NORTHERN TOWNSHIP, BELTRAMI COUNTY
MINNESOTA

APRIL 1986

MALCOLM PIRNIE

4. SITE SECURITY PLAN

4.1 Objective

This Site Security Plan is designed to limit access to project work areas by the public during the conduct of RI activities near the Kummer Sanitary Landfill. The procedures included in this plan are considered adequate and reasonable in view of the nature of activities planned for the Kummer Site. The activities planned include soil borings, well installation, air monitoring, subsurface soil and ground water sampling, and surveying of wells.

4.2 Assessment of Security Needs

Of the activities planned and listed above, the greatest need for security is associated with boring and well installation for two primary reasons. First, the public must be protected from injury around dangerous drilling equipment and from exposure to potentially contaminated material near work areas. Secondly, the integrity of borings and wells must be protected from acts of vandalism which would render then unusable.

Security needs vary for different work areas. For simplicity, work areas are being defined as being "on-site" or "off-site." In respect to this Site Security Plan, "site" shall mean the Kummer Sanitary Landfill located on Anne Street NW. Basically, "off-site" encompasses the surrounding residential and commercial neighborhoods located near the landfill.

4.3 Security Procedures

4.3.1 Fencing

Consideration will be given to selecting work areas that present a minimum of risk to the public. If this is not possible, then a wooden snow fence will be erected completely around drill rigs while they are stationed at boring and well locations in those areas of high public use, i.e., near busy intersections. The fence shall be at a minimum radius of 50 feet from the drill hole when conditions permit. Project personnel shall maintain the fence at all times. Neither the site manager nor the drilling supervisor will allow unauthorized personnel within the fenced area. All equipment will be stored within the fenced area. There will be one point of entrance through the fence unless safety considerations require additional points of egress. As an added measure in areas of traffic, orange pylons will be prominently displayed to warn motorists of work areas.

4.3.2 Signs

At least two signs will be posted on the exterior side of barrier fences warning against entry. Wording on the signs shall be "Warning -- DO NOT ENTER" or comparable language. One sign shall be posted at the point of entry. All signs shall be clearly visible and in bold colors.

4.3.3 Hole Protection

It is anticipated that several holes may require more than one day to drill. In such cases the drilling rig is left stationed over the hole to maintain alignment overnight. During these times a clean 55 gallon drum will be inverted and placed over the hole completely covering it and any equipment (i.e., mud pipe) protruding from the hole. To secure the drum over the hole, the drill rods and bit of the drill rig will be lowered onto the drum. The weight of the rods on the drum will prevent removal of the drum from the hole. When not in use, the drum will be sealed and set aside. In cases when augers are being used, the last auger flight will be left in the hole at the end of the day's activities securely bolted to the drill rod. The auger will effectively seal the hole eliminating the need for a drum to cover the hole.

All hand tools or other miscellaneous equipment will be stored in locked in boxes firmly attached to the drilling rig to prevent theft.

4.3.4 Police Patrols

Prior to starting work, the Beltrami County Sheriff (phone: (218) 751-9111) will be contacted and notified of intended site operations. The Project Manager will request that the sheriff periodically conduct patrols at work locations. The sheriff will be informed of all relevant information regarding site activities. The sheriff will be requested to notify the Project Manager and drilling supervisor of any circumstances observed by them which breaches site security. Should any accidents occur in which unauthorized personnel are injured in any way, the sheriff will be instructed to provide medical help first.

4.3.5 Other Procedures

1. All project personnel will be informed of the need to prevent public contact during work activities. They will be instructed to use their best judgement during their work to minimize such contact.

2. Project personnel working along roadways (i.e., surveyors) shall wear warning vests with bright colors.

3. Communication with all interested parties will be maintained to facilitate site operations while providing adequate site security. These parties include:

   a. Site Project Manager (Malcolm Pirnie/LBG)
   b. Safety Officer (Malcolm Pirnie)
   c. Drilling Supervisor (Braun and/or Stevens)
   d. Project Leader (MPCA)
   e. Police (Beltrami County Sheriff, dial 911 in Northern Township)
   f. Fire Department [Bemidji, (218) 751-8001]

CHAPTER 5

POTENTIAL RESPONSIBLE PARTY SEARCH

KUMMER SANITARY LANDFILL

NORTHERN TOWNSHIP, BELTRAMI COUNTY
MINNESOTA

APRIL, 1986

MALCOLM PIRNIE

5. POTENTIAL RESPONSIBLE PARTY SEARCH

5.0 Introduction

This chapter provides the results of the potential responsible party search conducted for the Minnesota Pollution Control Agency (MPCA) by Malcolm Pirnie, Inc. as part of the Work Plan for the Kummer Sanitary Landfill Remedial Investigation/Feasibility Study (RI/FS). The search was conducted during November 1985 and was authorized under multi-site RI/FS Contract Work Order No. MP-02 dated October 10, 1985. All work generated under this chapter was performed in accordance with the guidelines expressed in the RI/FS Work Plan Scope of Work for: Kummer Sanitary Landfill, September, 1985.

The objective of the Kummer Sanitary Landfill Potential Responsible Party Search is to provide MPCA with data to aid in the development of legal and enforcement actions against responsible parties. Malcolm Pirnie acknowledges that all information and data expressed in this report was obtained with the legal guidance of the MPCA Solid Waste Enforcement Division. Any legal impasses encountered by Malcolm Pirnie under this guidance have been specified in the appropriate section of this report.

The methodology for the Potential Responsible Party Search follows the guidelines expressed in USEPA document, "Procedures for Identifying Responsible Parties at Uncontrolled Hazardous Waste Sites," Office of Legal and Enforcement Counsel, Denver, Colorado, February 1982. The Potential Responsible Party Search for Kummer Sanitary Landfill is organized into six tasks. Each task incorporates the essential components of the RI/FS Work Plan Scope of Work. The following is a description of the tasks included in this report.

Task 1 - Follow-Up on MPCA Requests for Information

MPCA Request for Information (RFI) Documents were distributed to Potential Responsible Parties (PRPs) during Spring 1984. RFIs were screened according to specific criteria developed for this project.

Task 2 - Owner Follow-Up

This task involves inquiries to the site owner on the history of site operations and the involvement of PRPs in these operations.

Task 3 - Information Search

Files and other documented evidence resources were reviewed to identify potential responsible parties and other sources of contamination contributing to the problem at the Kummer site.

Task 4 - Personal Interviews

This task was designed as a follow-up to Tasks 1, 2 and 3 where positive responses and findings would lead to direct inquires of knowledgeable people including state and local officials and PRP representatives.

Task 5 - Field Investigations

Field investigations, generating sampling data and site inspection reports, were examined to develop a "fingerprint" of contaminants and characteristics present at the actual landfill site. Fingerprint analysis may aid in the identification of PRPs.

Task 6 - Reporting

Information gained through the PRP search will be made compatible with the Minnesota Land Management Information Center (LMIC) data management system. Files will be created containing specific documentation of all PRP searches including information on PRPs contaminant releases and financial viability.

5.1 Task 1 - Follow-Up on MPCA Requests for Information

In an effort to identify PRPs of the Kummer sanitary landfill, 42 companies and academic institutions in the Bemidji, Minnesota area, were issued Requests for Information (RFI). The RFI requested information concerning past disposal practices of hazardous and solid waste at each facility. The RFI was issued by the MPCA Solid Waste Division during the Spring of 1984. Thirty-three companies responded to the RFI over the course of one year. Responses varied greatly in their sophistication, completeness and detail. Respondents included lawyers, corporate environmental specialists, managers, operators, and owners. Some responses provided comprehensive accounts of disposal practices. One respondent, for example, included lab results characterizing the waste generated by his facility. Other respondents to the RFI gave poor accounts of disposal practices providing incomplete and sometimes incomprehensible responses to RFI questions.

Although the RFI responses lacked consistency, a matrix-type data base was developed and each company or academic institution was screened for compliance with the following criteria:

1. The storage or handling of hazardous substances at a facility
2. Lack of disposal practice information dating back to 1971
3. Involvement in a business or trade that has a high probability for handling hazardous materials
4. Poor record keeping practices demonstrated through responses to the RFI
5. Improper completion of the RFI or no response
6. Lack of general knowledge concerning past disposal practices

The list generated as a result of this screening is by no means complete. The selection of PRPs must be viewed as an iterative process which is constantly undergoing update and changes. A comprehensive list of PRPs can only be developed through the additional information searches provided in the remainder of this report.

The result of Task 1 is a preliminary list of companies and academic institutions which can be considered Kummer sanitary landfill PRPs. Table 5-1 provides the names of these institutions and the specific criteria they met in responding to the RFI. The list presented in Table 5-1 will be revised as other tasks in this report are completed.

5.2 Task 2 - Owner Follow-Up

The purpose of this task was to personally contact Charles Kummer, owner of the Kummer sanitary landfill, for his input into the identification of potential responsible parties. This task has been postponed, however, due to a legal impasse reached by both Malcolm Pirnie and MPCA. The legal impasse is the result of Malcolm Pirnie not having proper status within the State of Minnesota's legal framework to conduct interviews with potential responsible parties. Positive actions to designate Malcolm Pirnie as an agent of the MPCA have been taken by the MPCA project officer. Once Malcolm Pirnie has achieved the correct status, achieved by becoming a designated agent of MPCA, these interviews will be conducted and the subsequent information shall be incorporated into this report.

5.3 Task 3 - Information Search

The purpose of the information search is to provide documentation or references to documentation disclosing the identify of PRPs of the Kummer sanitary landfill. The information search incorporates all components of the PRP search as expressed in the September 1985 Scope of Work. An effort was made to review all available files and information to provide data that would directly or indirectly identify PRPs. Direct identification may be made through the review of files containing information on known generators of hazardous waste who disposed at the Kummer facility. Indirect identification may be made through the review of files describing on-site conditions or trends in disposal practices that may be traced to PRPs.

As stated in the RI/FS Work Plan Scope of Work, efforts thus far to identify potential responsible parties have produced very limited results. Every effort to obtain and review information sources was made within the MPCA Solid Waste Enforcement Division's legal guidance and the State of Minnesota's regulatory framework. Potential information sources include: MPCA files, County of Beltrami files, City of Bemidji files and any personal or corporate files that document a chronological profile of disposal practices at the Kummer facility.

5.3.1 MPCA Information Search

The MPCA is the chief solid waste regulatory agency in the State of Minnesota. As might be expected, the MPCA possesses the most information regarding disposal practices at the Kummer facility as well as in its vicinity. MPCA files include solid waste site inspection files, RFI response files, CERCLIS files and disclosure files.

5.3.2 Site Inspection Files

MPCA solid waste site inspections are well documented from the inception of the Kummer facility until its closure in 1984. Starting in 1971, inspection reports were filed at a minimum of one every three months. These reports provide an excellent chronology of events from the initial compliance of the Kummer facility with regulations to the collapse of the facility's "good standing" with MPCA. A summary of inspection reports that reference hazardous, toxic or prohibited waste is provided in Table 5-2.

There are several references to hazardous waste disposal in the MPCA site inspection files. Site inspection reports from the early 1970's are of particular interest to the PRP search. These reports state that the Kummer facility was actually required to accept hazardous and toxic waste and was to provide a designated area at the site for hazardous waste disposal. This area was to contain 2 feet of clay at the bottom of the "cell" to allow for proper sealing. There are also several letters from county and state officials calling for the construction of a hazardous waste facility at the new (Kummer) sanitary landfill. The bid process for developing the landfill included provisions for prices that a perspective landfill owner would charge for "noxious liquid." The practice of accepting hazardous waste at a sanitary landfill is not uncommon for the early 1970's. Poor record keeping by the landfill owner make it difficult to identify any users of such an area. MPCA officials do not believe that a hazardous waste disposal area ever existed at the Kummer facility since there is no official evidence of its construction. If one did exist, however, a point source for ground water contamination could be identified. This identification may lead to user's of the hazardous waste disposal area and, therefore, potential responsible parties.

In addition to solid waste site inspection reports, there are several sources of information pertaining to hazardous waste site inspections. Hazardous waste site inspection reports include two filed by Larry Olson of MPCA's Detroit Lakes office and one from Dick Kable of MPCA, Roseville. The two reports by Larry Olson concern two auto body/salvage operations located in the vicinity of Kummer landfill. The first report accounts for an inspection, conducted on April 29, 1985, of Hensley Auto Supply located at 4701 Irvine Avenue N.W. in Bemidji. The report covers the solid and hazardous waste management practices of Hensley Auto Supply. These practices include on-site storage and potential on-site disposal of crank case oil, gasoline, solvents, antifreeze, floor dry compounds and auto bodies. The report states that the present management practices for disposing these items are questionable. Further information is required on this site in order to develop a position on its role as a PRP.

The hazardous waste management practices of Far North Auto, Inc. were also inspected on April 29, 1985. Far North Auto, Inc. is located on Old Highway 71 North in Bemidji. Far North Auto came under scrutiny for its alleged on-site disposal of solvents, gasoline, oil and antifreeze. In this inspection report, Larry Olson states that the "operation of Far North Auto, Inc. is quite clean;" however, the company was cited for poor housekeeping practices two years prior to the filing of this report.

The last hazardous waste citing present in the MPCA solid waste site inspection files refers to an 11,000 gallon spill of No. 2 fuel oil on February 3, 1975. The spill occurred at the site of the Lakehead Pipeline Company. In a letter to Wayne Nessman of Lakehead Pipeline Company from Dick Kable, MPCA would authorize the incineration of spilled material and authorize the disposal of contaminated soil at the Kummer sanitary landfill.

5.3.3 CERCLIS List Sites

The MPCA, in conjunction with the USEPA, maintains a list of uncontrolled hazardous waste sites currently under investigation in the State of Minnesota. This list, derived from the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS formerly ERRIS), traces a "Superfund" site from discovery to clean-up. Presently three Superfund sites exist in Beltrami County and their files were reviewed as part of the PRP search.

Kummer sanitary landfill is one of the three Superfund sites located in Beltrami County. Background information derived from the CERCLIS files includes a preliminary assessment which concludes that the source of chlorinated solvents in the ground water in the vicinity of the site is unknown. No reference to the identity of PRPs exists in the Kummer file.

Cedar Service, Inc. is also on the list of Superfund sites in Beltrami County. MPCA has conducted a review of this telephone pole wood preservation operation and recommends "no further action" be taken investigating the site. Ground water contamination, on-site disposal of pentachlorophenol sludge and air drying operations were observed at the site. The company operated from 1971 until 1980 and many of its early disposal practices are unknown. Further research on these practices should be conducted; however, the firm is no longer in business.

Superwood Corporation, Nu-Ply Division is also located in Beltrami County and is on the state Superfund list. There is record of unauthorized dumping at the site since 1954. Phenols, oil and grease, fluoranthene and polyaromatic hydrocarbons have been detected in samples collected near the site. Past hazardous waste management practices include on-site disposal, unauthorized landfill disposal and spill clean-up operations. The overall picture of the firm's past disposal practices is still a question. The operation should be researched further as a PRP of the Kummer site. Disposal of wastes at the Kummer site may be a former practice of the facility.

5.3.4 MPCA Disclosure Files

The MPCA requires that companies and government agencies file with the state a disclosure of any hazardous material used or stored at a facility. Disclosure files were reviewed and 15 facilities handling hazardous materials in Beltrami County were identified. Disclosure information includes facility names, addresses, types of hazardous materials handled at the site, amount of hazardous material and hazardous waste management practices. EPA identification numbers are required for all haulers, transporters and facilities handling a hazardous material and names and identification numbers must be provided in the disclosure. Table 5-3 provides a summary of the results of disclosure file search.

The MPCA disclosure files include information on present management practices of hazardous materials. The review of these files is important for the Kummer landfill PRP search because they identify facilities that are handling hazardous materials in Beltrami County. This could lead to information on past disposal and management practices that may help in identifying Kummer landfill PRPs. A follow-up study to the information provided in Table 5-3 will be conducted in order to fully define the past hazardous waste management practices of each facility. This study is proposed once Malcolm Pirnie gains the appropriate status within MPCA to conduct personal inquiries with PRPs.

5.3.5 County, City, and Township Information Searches

In the State of Minnesota, MPCA is the lead regulatory and enforcement agency for solid waste sanitary landfills. This, combined with the Kummer sanitary landfill's status as a privately-owned facility, left very little or no hard copy information available for review from county, city or township files. These governments, however, may contain information on PRPs of the Kummer facility. An effort to review this information is postponed until Malcolm Pirnie's status as a designated agent of MPCA is received. This status will enable Malcolm Pirnie to pursue contacts with PRPs on the "working" list generated from this search to date. Once these contacts are made, local government files on those PRPs still on the list will be pursued.

5.3.6 Private Information

As stated above, Malcolm Pirnie has postponed its pursuit of contacts with PRPs, including Charles Kummer, until the appropriate status is granted by MPCA. This postponement is in accordance with MPCA legal guidance and has been approved by the MPCA project officer and MPCA contract officer. File searches and personal contacts with PRPs will follow the appropriate MPCA action.

5.4 Task 4 - Personal Contacts

Since Malcolm Pirnie is not a designated agent of the MPCA and was unauthorized to contact potential responsible parties, the results of Task 4 are limited. The revised scope of work for Task 4 encompasses contacting knowledgeable state, county and township personnel in an effort to identify Kummer landfill potential responsible parties and other sources of contamination in the Bemidji, Minnesota vicinity.

The MPCA project staff for the Kummer Sanitary Landfill RI/FS were interviewed for their input on the source of the ground water contamination. Staff members interviewed include Mr. Larry Olson of MPCA, Detroit Lakes; Mr. Bruce Nelson of MPCA, Roseville; and Mr. Steve Riner of MPCA, Roseville.

There are several theories on the source of the ground water contamination in the Kummer landfill vicinity. MPCA maintains that the landfill is the sole source of the contamination in the area. Contaminants reached the landfill during the course of normal residential and commercial refuse collection. Hazardous materials, either deliberately or accidentally, were collected and disposed at the landfill in this manner. Since no liner or containment system existed at the site, the contaminants were free to migrate through the highly permeable underlying material and into the ground water. Based on this hypothesis, local companies and academic institutions who might have disposed of hazardous materials during the course of normal operations are being investigated. One company's disposal practices may disprove this hypothesis. This company is Hensley Auto Supply located at 4701 Irvine Avenue N.W. There is concern over this company's operation based on two reasons: 1) the company lies near the area of ground water contaminants and 2) the company handles hazardous substances of a similar nature to those detected in the ground water near the landfill. This company will go through a more detailed investigation in the remaining tasks of this report.

As part of Task 4, one Beltrami County official was interviewed on the source of contamination at the Kummer site. The official, Mr. Bill Patnaude of the Beltrami County Zoning office, stated that many companies in the county handle solvents that are used in the cleaning of machine parts. These solvents are potentially halogenated and unauthorized disposal of these solvents is alleged. This disposal may be contributing to the ground water contamination from the landfill directly or from unauthorized disposal areas near the landfill.

The City of Bemidji maintains a sanitation department directed by Mr. Michael Barkley. Mr. Barkley stated there were several hauling operations bringing refuse in from other parts of the county. The City of Bemidji also maintained a hauling service that brought refuse to the landfill. Mr. Barkley did not have any direct knowledge of potential responsible parties who disposed of hazardous materials through the city's hauling operations.

Conclusions that can be drawn from interviews with state and local officials include:

- The Kummer sanitary landfill is the suspected source of the ground water contamination in Beltrami County.
- The pathway of hazardous materials to the landfill is through normal collection practices of industrial and municipal refuse.
- One company, Hensley Auto Supply, may be directly contributing to the ground water contamination and requires further investigation.
- Halogenated solvents are commonly used in Beltrami County for industrial purposes.
- Several refuse hauling operations servicing the landfill exist. These operations collect refuse throughout the county.

5.5 Task 5 - Site Investigation

Site investigations at the Kummer sanitary landfill have been extensively conducted by MPCA. On-site investigations include ground water sampling and solid waste inspections. Data generated from these investigations include Solid Waste Site Inspection Reports (reviewed in Task 3) and analytical data. The analytical data are of particular interest in this section of the Responsible Party Search because it provides a starting point for "fingerprint" analysis of contaminants. Potential responsible party searches utilizing this technique are specifically provided for in the USEPA document "Procedures for Identifying Responsible Parties at Uncontrolled Hazardous Waste Sites."

The methodology for performing "fingerprint" analysis in this section of the Potential Responsible Party Search will consist of the following:

- Review of MPCA Volatile Organic Compound (VOC) analytical data generated from the sampling of ground water wells at the Kummer facility on May, 4, 1982, July 7, 1983 and October 4, 1983

- Review of results of Tasks 1-4 of this report for identification of companies and academic institutions who show a history of storage/disposal practices of hazardous substances

- Compare the findings of Task 1-4 with the VOC data generated for the ground water sampling of May, 4, 1982, July 7, 1983 and October 4, 1983

The methodology for this task is in accordance with USEPA and Malcolm Pirnie operating guidelines. The results of this task should provide a tentative listing of responsible parties of the ground water contamination in the vicinity of the Kummer sanitary landfill. A more detailed investigation is needed, however, before positive identification can be made.

5.5.1 VOC Analytical Results

Three ground water sampling events took place at wells in the vicinity of the Kummer site. These sampling events took place on three dates in 1982 and 1983. Samples were analyzed for 52 volatile organic compounds by Minnesota Department of Health Methods. As many as 27 volatile compounds were detected in various concentrations in the ground water samples. Nineteen halogenated volatile organic compounds and eight nonhalogenated volatile organic compounds, comprised the list of compounds detected. The volatile organic compound detected in the samples are identified:

- Methylene Chloride
- 1,1-Dichloroethane
- cis 1,2-Dichloroethylene
- 1,1,2-Trichloroethylene
- Trichlorofluoromethane
- 1,1-Dichloroethylene
- 1,2-Dichloropropane
- Vinyl chloride
- Chloromethane
- Dichlorofluoromethane
- Bromomethane
- 1,2-Dichloroethane
- 1,1,1-Trichloroethane
- Dichlorodifluoromethane
- Acetone
- Ethyl Ether
- Benzene
- Toluene
- Total Xylenes
- Tetrahydrofuran
- Ethyl Benzene
- 1,1,2,2-Tetrachloroethylene
- Chloroform
- Chloroethane
- 1,1,2,2-Tetrachlorethane

5.5.2 Results of Tasks 1-4

Results of Tasks 1-4 of this report have identified those companies and academic institutions in Beltrami County who historically handled hazardous materials. Tasks 1-4 provide information gained through interviews, review of hazardous waste disclosures and RFI documents. To identify responsible parties of the Kummer sanitary landfill, the analytical data, representing the compounds detected in the ground water near the landfill, will be compared to the actual hazardous materials handled by the sites reviewed in Tasks 1-4. This "fingerprinting" of contaminants with those facility's who have historically handled hazardous materials should focus the scope of the Potential Responsible Search. Table 5-4 provides a summary of the results of Task 5.

The "fingerprint" analysis of compounds detected in the ground water identifies 16 facilities in Beltrami County who handle halogenated solvents. These facilities have filed RFIs or disclosures with MPCA. The combination of these two elements, expressed in Task 5, developed the responses presented in Table 5-4. The companies and academic institutions presented in Table 5-4 represent facilities who volunteered to disclose hazardous waste management information. It appears likely that there are other institutions in Beltrami County who handle hazardous waste who did not volunteer information. The hazardous waste management practices of these facilities are unknown and need to be researched.

5.6 Task 6 - Reporting

The Potential Responsible Party Search involves the research of many information sources. These information sources include files, memos, telcon memos, field notes, inspection reports and analytical data. To control the information sources reviewed and generated as part of the PRP search, a data management filing system has been developed. This system will be made compatible with the LMIC data management system as part of this task.

File organization will be as follows. Separate file subheadings will be maintained for all documentation generated and reviewed in this search. The file subheadings are detailed:

- Work Authorization/Work Plan Scope of Work
- Analytical Data
- Background Information
- Correspondence
- Telephone Correspondence
- Field notes
- QA/QC Documentation
- Reports

The data contained in each file subheading will be controlled by a file index system and unique file numbering system. Files will be maintained by a designated file custodian selected specially for this project.

As expressed in the RI/FS Work Plan Scope of Work, all information generated within this chapter will be made compatible with the LMIC data management system. The project manager will provide the necessary personnel to complete this provision of the Scope of Work. All information included in the files maintained for this chapter shall be made compatible with the LMIC system.

5.7 Conclusions

The Potential Responsible Party Search is one of six chapters submitted as part of the RI/FS Work Plan for Kummer Sanitary Landfill. The PRP Search was divided into six tasks each of which follows USEPA, MPCA, and Malcolm Pirnie operating guidelines. All tasks are designed to incorporate the specific elements expressed for this chapter in the RI/FS Work Plan Scope of Work.

The follow-up on MPCA Requests for Information (RFI) documents led to a list of 28 companies and academic institutions in the Bemidji, Minnesota area who met one or more of the criteria expressed in Task 1. This list represents the first step of an iterative process of identifying PRPs.

As a result of the review of MPCA information sources, additional PRPs were identified. The information sources reviewed include: site inspection files, CERCLIS files, project files and disclosure files. A chronology of events at the facility was developed as a result of this review. In addition, three Superfund sites were found to exist in Beltrami County. This task also revealed 15 companies in Beltrami County who handle hazardous materials. Hazardous waste inspection reports revealed three sites with poor hazardous waste management practices. One of these sites may be directly contributing to the ground water contamination.

A comparison of ground water analytical data and site disclosures was developed in Task 5 of the PRP Search. This comparison concluded that 16 facilities in the Bemidji area handle substances that were detected in the ground water near the Kummer site.

Several tasks in the PRP search were left incomplete due to legal impasses. These impasses are being addressed by the MPCA project staff. Malcolm Pirnie will be able to complete these tasks once designated agent status is gained through the proper MPCA channels.

All information and data generated as a result of this search will be maintained through a data management system developed specially for this chapter. In addition, all information will be made compatible with the LMIC data management system as specified in the RI/FS Work Plan Scope of Work.

Future actions required to address the data needs expressed in this chapter include follow-up studies on Tasks 1, 3 and 5, pursuing appropriate status within MPCA in order to conduct Tasks 2 and 4 and developing specific sampling operations of localized sources of ground water contamination in the vicinity of the Kummer site. These actions will be conducted as part of the

Remedial Investigation. Results of these studies will be delivered in the RI report.

CHAPTER 6

WORK PLAN

KUMMER SANITARY LANDFILL

NORTHERN TOWNSHIP, BELTRAMI COUNTY
MINNESOTA

APRIL, 1986

MALCOLM PIRNIE

6.0 RI/FS WORK PLAN

The objective of the RI/FS Work Plan for the Kummer site is to present in detail the investigation procedures which will be employed during the Remedial Investigation. The investigations outlined in the Work Plan are designed to: 1) generate data where existing data are lacking for the purpose of preparing the Remedial Investigation Final Report; 2) determine whether hazardous materials are migrating from the landfill site, 3) assess actual and potential impact on public health, welfare, and the environment; and 4) produce additional data of sufficient quantity and adequate technical content to identify and evaluate feasible alternative response actions.

This Work Plan has been formulated based on a review of information and technical data available for the Kummer site as discussed in Chapter 1, Evaluation Report and upon the need for additional data to meet the requirements described above. A fundamental consideration in the development of the Work Plan is the need for information which will support the recommendation of a feasible and cost-effective alternative.

The proposed Work Plan is a logical, sequenced approach which first addresses the questions of whether contaminants are migrating from the Kummer Landfill, what those contaminants and their concentrations are, how they are migrating from the site, and what hazards and risks are posed to public health and the environment by their release. A proposed Time Schedule required to accomplish the tasks described below follows at the end of this chapter.

6.1 Preliminary Field Inspections

6.1.1 Inspection of Existing Monitoring Wells

On-site monitoring wells installed during previous investigations will be inventoried, inspected and tested. Some of the wells may now be destroyed or unuseable. Similarly, some wells may be susceptible to contamination via surface runoff or deliberate or accidental activities at the site. These should either be abandoned or secured.

At this time, the Project Team does not propose to use the existing wells for obtaining ground-water samples due to their unsuitable construction, lack of security, and unclear history of use. Wells which the team believes can be used for obtaining water-level data will be tested to determine whether they are still open to the water-bearing formation. This will entail recording the initial water level, bailing or pumping the well, and measuring water-level recovery. Wells which do not respond to evacuation will not be used in this project. The useable wells will be properly secured with protective casing, caps, and locks and will be included in the elevation survey.

The Project Team will attempt to abandon those wells which do not respond to evacuation or redevelopment. Abandonment will involve pulling the well and grouting the hole from bottom to top. Abandonment in accordance with MDH procedures will be followed.

6.1.2 Monitoring Well Location Verification

New monitoring well locations are proposed below in Section 6.3, but have not been field inspected for determination of accessibility, land ownership, local hazards, utilities, local sources of contamination, etc. Final locations will be marked in the field.

6.1.3 Residential Well Sampling Program

The MPCA has instituted a program of residential well sampling in the affected area of Northern Township. A recent survey was conducted during the week of March 24, 1986 in which samples from six residential wells were obtained and submitted to the Minnesota Department of Health for the analysis of volatile organics using MDH Method 465B. The Project Team will review analytical data generated from the residential well sampling program as made available by MPCA. These data will be utilized to help characterize ground water conditions in the residential area along with information generated during the remedial investigation. Evaluation of such data may result in modifying particular RI activities in order to generate more useful information. Results of recent water quality surveys conducted by the MPCA as well as historical data for those private wells included in these surveys will be added to the Project Team's computerized water-quality data base. In addition, the Project Team may propose to MPCA changes in the residential monitoring program based on findings generated during the RI.

6.2 Vadose Zone Monitoring

The Project Team will employ vadose zone monitoring as an aid to optimum placement of monitoring wells in the immediate vicinity of the landfill. Vadose zone monitoring involves sampling and qualitative analysis of soil gas present in the pore space of the unsaturated soil zone. This zone may contain volatile organic compounds that have volatilized into the unsaturated zone from potentially contaminated ground water present in the saturated zone.

Soil gas monitoring will be conducted along those lines shown on Plate 1 or as field conditions dictate. Sampling points will initially be located approximately every 100 feet along the eastern side of the landfill and every 125 feet on the south, west, and north sides of the landfill. As positive indications of volatile compounds are recorded, the spacing between sampling points will be progressively decreased in order to find areas of highest volatile organic contamination. The wells planned for installation around the perimeter of the landfill will be placed in areas indicating the highest concentrations of volatiles.

6.3 Ground Water Monitoring Well Installation

There is limited geologic or hydrogeologic data available for the Kummer site. The drilling and well installation program is, therefore, a critical part of the RI. The Project Team proposes to install monitoring well clusters of one to three wells each at up to 9 locations shown on Plate 2. For quick reference, these locations are shown on Figure 6-1. These well sites are designed to obtain data where data gaps exist or where confirmation of existing data is desirable. The proposed depths of wells given in Table 6-1 are considered reasonable estimates based on available information.

The exact number, depth and configuration of monitoring wells may vary as field conditions dictate. However, any major changes in monitoring well locations will be reported to the MPCA site technical analyst prior to field implementation.

6.3.1 General Technical Approach

The initial work will consist of soil boring and monitoring well installation at the locations shown in Figure 6-1. Prior to installation of wells, vadose zone monitoring will be performed as described in Section 6.2, to detect volatile organic gases in the vadose zone. The monitoring will

KUMMER SANITARY LANDFILL

NORTHERN TOWNSHIP

APPROXIMATE CLUSTER WELL LOCATIONS

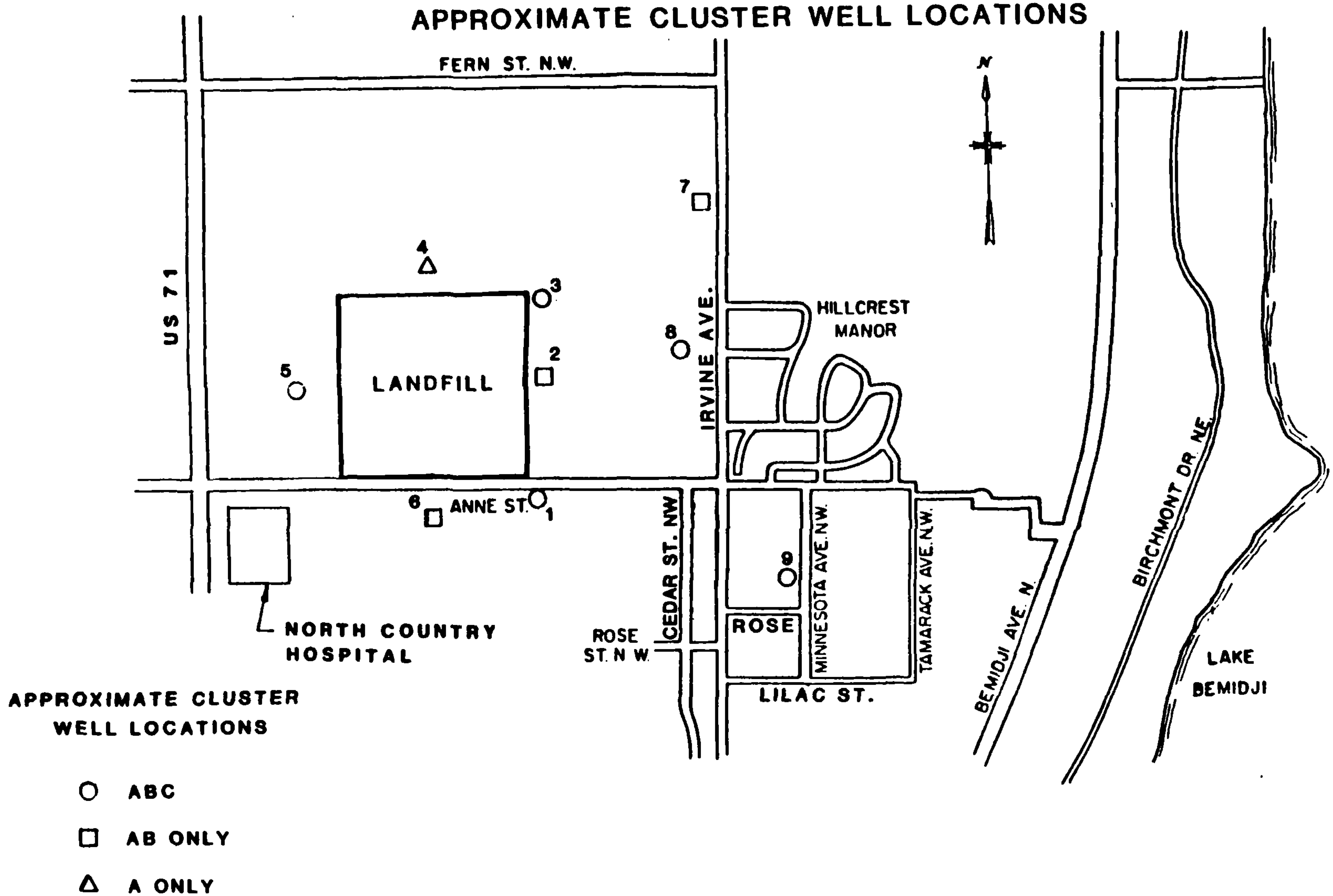


FIGURE 6-1

KUMMER SANITARY LANDFILL

Table 6-1

Proposed Boring and Well Depths

Well Cluster Location	Total Estimated Boring Depth (ft)	Estimated Well Completion Depths (ft)		
		"A"	"B" b/	"C" c/
1	60	25	40	60
2	40	25	40	--
3	60	25	40	60
4	25	25 a/	--	--
5	60	25	40	60
6	40	25	40	--
7	40	25	40	--
8	60	25	40	60
9	60	25	40	60
Totals	445	225	320	300

a/ Split-spoon sampling at 5-foot depth intervals from 0 to 25 feet below grade.

b/ Split-spoon sampling every 5 feet from 0 to 40 feet below grade.

c/ Continous split-spoon sampling from 40 to 60 feet below grade.

provide an indication of optimum locations for ground-water monitoring wells. This survey will be conducted around the periphery of the landfill. The exact location of well clusters near the landfill will depend primarily on the results of this survey. Split-spoon soil samples will be collected during soil boring. The well completion depths listed in Table 6-1 are intended to provide a reasonable estimate of depths for planning and budgeting purposes. The exact depth of the wells will probably vary from those listed in Table 6-1 depending on stratigraphy and the presence of contaminants as detected by an OVA.

The ground-water monitoring well installation program is designed: 1) to develop essential information on site stratigraphy; 2) to concentrate wells in areas where ground-water contamination is suspected thus facilitating identification of maximum concentrations of contaminants; and 3) to delineate the vertical extent of contaminated zones. In order to achieve these objectives nine tentative locations have been selected for installation of test borings and monitoring wells. These locations are shown in Figure 6-1. Wells installed in clusters provide a three-dimensional view of subsurface conditions. This allows for the analysis of ground water at different levels below the ground surface, the determination of horizontal ground-water flow directions in each aquifer and the determination of vertical head relationships. The rationale for the locations of the clusters and the depths of wells within clusters is discussed in Section 6.3.2. Figure 6-2 is a diagram of a typical three-well cluster. For developing a cost budget it is necessary at this time to assume that the till layer (or clay layer as it is locally known) does exist. Contamination of the outwash aquifer below the till may be present, perhaps due to discontinuities in the till layer. Therefore, certain monitoring wells will be screened above the till layer while others will be screened below. Since some organic contaminants found at this site are heavier than water, there may be stratification of the contaminants within an aquifer. Therefore, shallow "A" wells will be screened in the water table and deeper "B" wells will be screened just above the till layer. The "C" wells will be screened below the till layer. Each of the nine locations shown in Figure 6-1 represent a multiple-depth well cluster except location No. 4 which is a single well.

KUMMER SANITARY LANDFILL
BEMIDJI, MINNESOTA
TYPICAL WELL CLUSTER

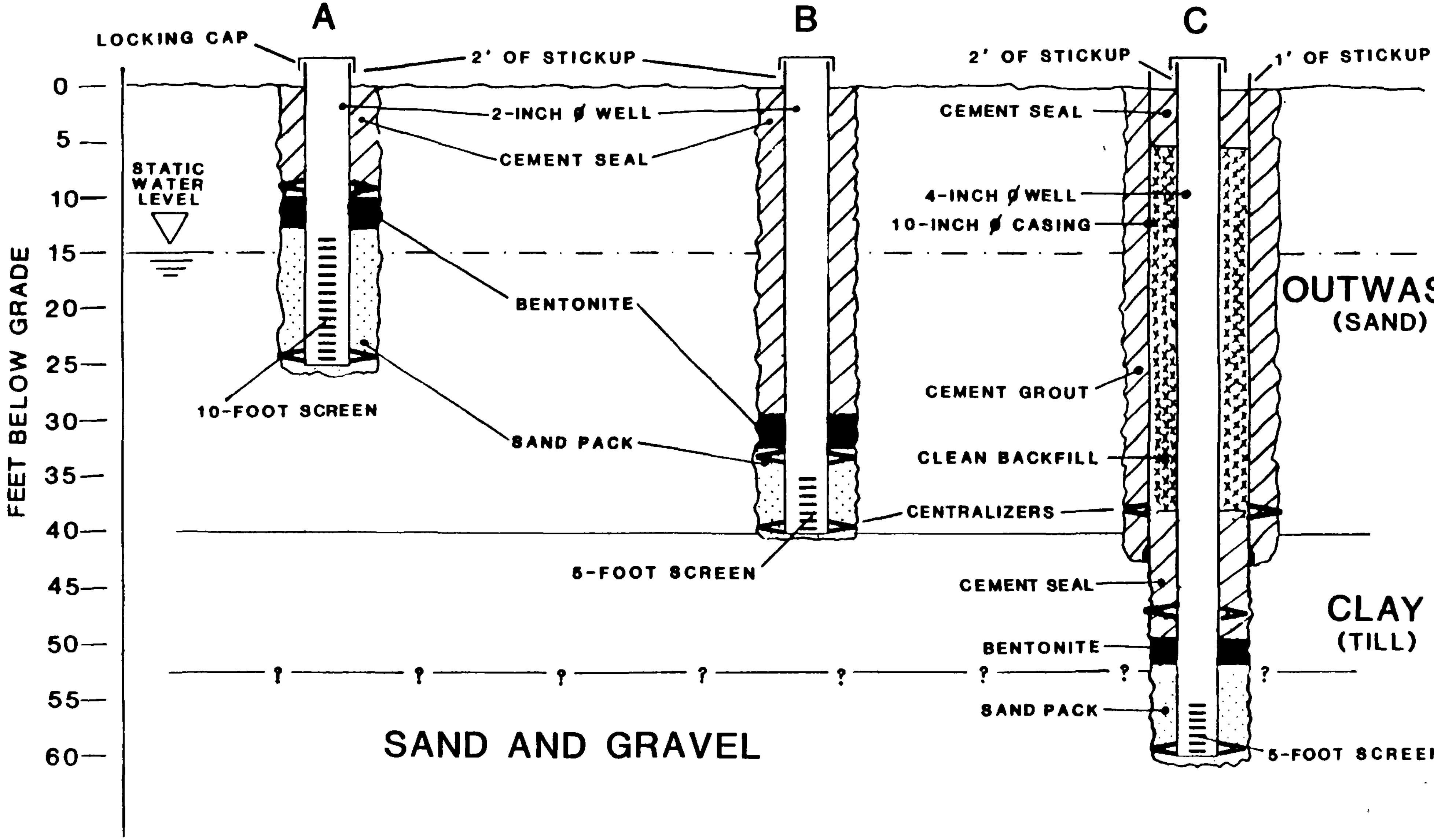


FIGURE 6-2

The vertical placement of well screens will be determined by both stratigraphy and contaminants detected by OVA measurements of split-spoon samples obtained during the borings. A drilling and split-spoon sampling protocol has been agreed upon by MPCA and the Project Team. This is described further in Section 6.3.3. In general, split-spoon samples will be taken at five-foot intervals in granular soils and at 2-foot intervals in fine-grained soils. More frequent sampling is required in fine-grained soils so that any pervious zones can be identified. The till will not be penetrated by an uncased hole to avoid allowing the potential exchange of contaminants between aquifers above and below the till. Stratigraphic information gained from the soil sampling in the "B" borings will be used to determine the depth of the "C" well outer surface casing. Once the upper aquifer is cased off in the "C" well, split-spoon sampling will be performed through the till and into the anticipated lower aquifer to a depth of approximately 60 feet below ground surface. As explained in detail in Section 6.6.1, OVA measurements will be taken of the split-spoon samples as the borings are advanced. Screens in the "B" wells will be set in the portion of the aquifer where organic vapor concentrations are highest. Based on results of the "B" well borings, the "A" well screens will be set in the water table to detect inorganic as well as organic contaminants which may be concentrated at or near the water table. The "C" well screens will be set just below the till layer in the outwash sand and gravel or in the till layer if the till has permeable zones.

Soil samples will be examined, logged, and saved for future reference by the on-site hydrogeologist. Additional split-spoon samples may be taken where stratigraphic changes occur and otherwise at the discretion of the hydrogeologist. If ground water samples from the "C" wells indicate the presence of contaminants, the Project Team may propose additional "C" wells in those clusters which have only "A" and/or "B" wells. In addition, deeper wells may be proposed to further determine the vertical extent of contamination. The need for additional borings and wells will be discussed with MPCA project personnel before being recommended.

The Project Team will use slug tests in selected wells to determine aquifer parameters such as hydraulic conductivitiy (permeability) and transmissivity. These tests are cost effective because they involve much less labor and equipment than a pumping test. Because slug tests provide information only on the area immediately surrounding the well, a total of 4 slug tests will be performed in wells of different depths.

6.3.2 Monitoring Well Justification

Well Nos. MW86-1A, B, and C - This well cluster (see Figure 6-1) is located immediately downgradient or southeast of the landfill across Anne Street. Positive results of the vadose zone survey will be used to finalize the exact location. Analytical results from this cluster will provide information regarding the character of any leachate leaving the site and migrating to the southeast. In addition, analyses of ground-water samples from this cluster may also indicate the presence of contamination at various depths, including below the till layer. Wells in this cluster will be screened in the saturated zone above and below the till layer.

Well Nos. MW86-2A, and B - This well cluster is situated to detect any contaminants migrating from the landfill to the east. Since clusters MW86-1 and MW86-3 will contain "C" depth wells, a "C" depth well in this cluster is considered unnecessary.

Well Nos. MW86-3A, B, and C - This cluster is located to detect any contaminants migrating in a northeasterly and/or easterly direction from the landfill. Wells in this cluster will be completed in the same zones as in cluster MW86-1.

Well No. MW86-4A - The location of this well is intended to detect any contaminants migrating within the shallow zone north of the landfill. Since contaminant migration is unlikely in this direction it is considered cost effective to include only one shallow well.

Well Nos. MW86-5A, B, and C - This cluster will be located sufficiently upgradient from the landfill and will provide water-quality information within each of the three depth zones monitored downgradient. This cluster may also detect any contaminants originating from any upgradient sources.

Well Nos. MW86-6A and B - This cluster is located to detect any contamination migrating from the landfill to the south in the upper aquifer. Since the ground-water gradient is considered to be toward the east or southeast, it is not necessary at this time to include a full cluster of monitor wells.

Well Nos. MW86-7A and B - Shallow contaminated private wells northeast of the landfill may indicate contaminant migration from the landfill to the northeast. Therefore, this cluster is located farther downgradient to detect any contaminants in the aquifer above the till.

Well Nos. MW86-8A, B, and C - Both shallow and deep private wells east of the landfill have shown detectable levels of organic contaminants. This cluster is located farther downgradient to confirm any contaminant migration from the landfill toward these private wells.

Well Nos. MW86-9A, B and C - Most of the contaminated private wells are located southeast of the landfill in the residential development on Minnesota and Cedar Avenues. This cluster will confirm the presence of any contaminants in this area. This cluster will provide more precise information regarding the vertical distribution of any contaminants found in this area since the depths and construction of nearby private wells are not well known.

Sampling of those monitoring wells listed above will be conducted as described in Section 6.6.2. If sample analyses from "C" wells indicate the presence of contamination in the lower aquifer, an evaluation of the necessity for additional "C" wells will be made by the Project Team. The quantity and location of any such wells will be discussed with MPCA project personnel prior to being recommended in any subsequent work activities.

6.3.3 Monitoring Well Design

The monitoring wells will be constructed according to Minnesota Department of Health Water Well Construction Code, Chapter 4725. Project Team hydrogeologists will supervise every aspect of drilling, construction, development and testing of monitoring wells. The Project Team is well aware of the need for: 1) setting and sealing surface casings to prevent surface runoff and shallow zone ground water from migrating into the borehole; 2) use of clean water for drilling; and 3) thorough cleaning of soil sampling equipment and drilling tools between uses 4) casings required to protect lower aquifers from contamination from upper aquifers. Greases, solvents or glues will not be used in the drilling, sampling or well construction process. Drilling muds will be avoided if possible. Precautions will be taken to preclude accidental aquifer contamination and to provide accurate, precise and totally defensible water-quality data.

For the "A" and "B" wells, the Project Team proposes to use 2-inch diameter stainless-steel monitoring wells in the shallow aquifer. Four-inch diameter stainless steel wells will be used for the deeper "C" wells. The 4-inch diameter wells could be used for small-scale pumping tests and, possibly, for small scale abatement wells, if this need should arise.

Shallow monitoring wells ("A") will be constructed using 10-foot lengths of 2-inch diameter, stainless-steel screen extending no less than two feet above the anticipated seasonal high water table. A 2-inch diameter stainless-steel casing with either welded or threaded and coupled joints will extend from the top of the screen to a point two feet above existing ground surface. The screen will be sand packed to no less than two feet above the top of the screen. The remainder of the annular space between the drill hole and riser pipe will be sealed with a cement/bentonite grout, containing no more than 2 percent bentonite by weight, to the surface. A locking cap and padlock will be used to secure the upper terminus of the well. Typical well construction diagrams are provided in Figure 6-2.

Wells completed below the till layer will be double cased above the till to prevent potential aquifer cross contamination. A suitable diameter hole will be advanced into, but not through, the till layer. A 10-inch diameter surface casing will be installed through the upper formation and grouted in place. A suitable diameter borehole will then be drilled below the surface casing, through the till and into the lower zone to be screened. Four-inch diameter stainless-steel screen and casing will be installed and sand pack will be added to at least two feet above the top of the screen. The annular space will then be backfilled with a bentonite/cement slurry to the land surface.

Soil sampling will be conducted using split spoons driven ahead of 4-inch nominal inner diameter hollow-stem augers or standard rotary drilling tools. Screen settings will be determined by geologic conditions, contaminant zones, and objectives of the monitoring program (proximity to other private wells or other contaminant sources). Clean water will be used to hold the hole open during drilling and while the monitoring well is installed. Drilling muds will be avoided if possible.

Upon completion, the wells will be developed by surging with a suction pump, surge block, compressed air, high pressure water jetting or a combination of these methods until the discharge is reasonably clear, sand free, and conductivity, pH and temperature measurements indicate stability has been reached. In addition, a level survey of the wells will be conducted by the Project Team's surveyor. Each cluster location will be placed on the existing base map. The elevation of the top of each well riser pipe and the ground surface, referred to mean sea level datum, will be obtained.

6.4 Water Level Survey

Water-level data will be obtained from new and appropriate existing wells. In order to minimize trips to the site, Project Team hydrogeologists will take water-level measurements during the RI while performing other duties at the site including sampling of monitoring wells. Water-level measurement data will be tabulated and contour maps will be prepared from the measurements for all aquifer zones using the site base map prepared by the Project Team.

Measurements will be made using a wetted steel tape or an electric water-level indicator. The water levels will be measured at the least contaminated wells first, progressing to those wells with increasingly greater levels of contamination. The measurement instruments will be rinsed with distilled water between measurement of contaminated wells.

6.5 Air Monitoring

During field investigations of the site, air quality monitoring will be performed using a portable OVA. Based on previous MDH data which shows low VOC concentrations in ground water, air quality is not considered a long-term health or environmental problem. Monitoring is primarily for site health and safety requirements and may be discontinued once site conditions are determined to be safe.

6.6 Sampling

6.6.1 Soil Monitoring

At each cluster well location a test boring will be drilled. Two-foot long split-spoon samples of the soils will be collected at five-foot depth intervals down to the till layer. Thereafter, split-spoon samples will be taken at 2-foot intervals to the bottom of the boring at approximately 60 feet below the surface. In clusters of "A" and "B" or just "A" wells, the split-spoon sampling will be conducted in the deepest well in each cluster. In clusters of "A", "B", and "C" wells, the split-spoon samples will first be obtained from the "B" well from the surface to its bottom at approximately 40 feet and then from the "C" well from the level at which the sampling in the "B" well was discontinued to the bottom of the "C" well. The split-spoon soil samples will be used to characterize the stratigraphy and subsurface soil conditions. This characterization will identify the suspected till layer beneath the landfill and determine its depth and thickness. Once this information is known, the Project Team can better detail the screen depths of wells to be installed at those locations.

In addition, these samples will be used to qualitatively assess the vertical distribution of contaminants at each cluster well location by scanning soil samples with an OVA to detect volatile organics. This will be accomplished by first driving the split spoon into the undisturbed soil ahead of the augers or rotary drill bit. An on-site hydrogeologist from LBG will then examine the sample as soon as it is withdrawn from the borehole. He will collect and document the sample employing the appropriate procedures as outlined below:

1. Immediately after the sampling device is opened, the hydrogeologist will scan the sample with the OVA. Project personnel will take care that the time between extraction of the sampling device from the borehole and the scanning procedure is minimized as much as practical to limit the loss of volatile compounds from the soil sample. Following scanning of the sample, the measurements are recorded referencing the scale as appropriate.

2. Visually examine the sample and record its characteristics (e.g., texture, color, consistency, moisture content, layering and other pertinent data). The soil samples will be logged using the Unified Soil Classification System (ASTM D 2488)

3. A representative portion of the sample will be placed in "soil jars" with an aluminum foil seal cap. If there is a stratigraphic change within the sample interval, portions of the sample from both stratum will be placed in different jars. The jars will be labeled with the date, depth of sample and boring number. The sample will be stored in the same jar and retained for possible future testing. However, soil samples will be turned over to the MPCA or discarded after 60 days if no tests are to be performed.

After the prescribed samples have been obtained, the sampling device will be decontaminated in accordance with the following procedure. The sampler will be brushed off and washed with a detergent solution, rinsed with water, and finally rinsed again with distilled water.

6.6.2 Monitoring Well Sampling

Samples from the wells listed in Section 6.3 will be collected in three rounds. The numbers of samples and the scope of analyses for the rounds will vary as described in Table A-7 of the Payment Schedule. The sampling and analytical program proposed has been designed to determine what contaminants, if any, are migrating from the landfill, whether they have migrated as far east as Irvine and Minnesota Avenues, and whether both upper and lower aquifers have been contaminated. The program also attempts to minimize the level of analyses adequate for completing the RI draft report and conducting the feasibility study by performing sampling and associated analyses in a step wise fashion. The analytical program is described in Section 6.7. It is noted that should results indicate that additional sampling is warranted beyond the three rounds, the Project Team will recommend that an expanded sampling and analytical program be implemented.

6.6.2.1 Round 1 Monitoring Well Sampling

A first round of sampling of the new monitoring wells will be conducted following well development. Samples will be taken from all wells in Well Clusters 1 through 6 around the landfill. Samples will be collected after the well has been bailed or pumped and the concentration or value for certain indicator parameters (pH, specific conductivity, and temperature) has stabilized. Detailed records will be kept of these field test parameters, the amount of water removed from the well, the condition of the sample, the field sampling technician's name, time and well identification information. In all cases samples will be collected with bailers.

Analytical data from this round will be used to determine the presence and levels of any contaminants in ground water around the landfill. Accurate, reliable, and updated information regarding ground water contamination will be required so that the Contamination, Public Health, and Environmental Assessments can be adequately performed.

Analyses of Round 1 samples will be for full EPA designated Hazardous Substance List (HSL) parameters. A review of past analytical data shows that nearly all analyses have been conducted for volatile organic compounds, specifically, those included in Minnesota Department of Health Method 465B. Available data do not suggest that only volatile compounds are potential problems at this site. Therefore, in order to fully characterize wastes potentially present in ground-water in the vicinity of the landfill, full HSL analyses are being proposed for a portion of the samples to be obtained.

6.6.2.2 Round 2 Monitoring Well Sampling

A second round of samples will be collected following receipt and evaluation of analyses from the first round. It is anticipated that a four week analytical turn around period will be required following submittal of samples to the laboratory. The sampling program for Round 2 will be heavily dependent on the results of Round 1 analyses. Samples in the second round will be obtained from those wells sampled in Round 1 in which analyses indicate the presence of contaminants. This sampling will be conducted to confirm contamination. In addition, the wells in Well Clusters 7, 8, and 9 will also be sampled for the first time.

The analyses performed for each of the wells to be resampled in Well Clusters 1 through 6 during Round 2 will include only the HSL fraction(s) in which contaminants were found in that well during Round 1. In addition, samples from all wells in Well Clusters 7, 8, and 9 will be analyzed for the HSL fractions in which contaminants were found in Round 1 analyses.

6.6.2.3 Round 3 Monitoring Well Sampling

A third round of sampling will be conducted to include only Well Clusters 7, 8, and 9 should Round 2 analyses of those wells indicate contamination. As in Round 2, the analyses of third round samples for each of the wells of Well Cluster 7, 8, and 9 will be limited to the HSL fraction in which contaminants were found in that well. Samples in the second and third rounds will be collected in the same manner described above for the first round of samples.

6.6.3 Surface Water and Sediment Sampling

Surface water normally exists in the borrow area immediately north of the fill area in the vicinity of Well G shown on Plate 1. In addition, well-defined drainage ditches exist along the western and southern perimeters of the landfill. However, it appears that these ditches have intermittent flow and are usually dry as they were during the Project Team's Preliminary Site Reconnaissance.

Limited sampling is proposed for both the surface water and sediments of the drainage ditches. The Project Team will attempt to collect three surface water samples: one from the ponded area near the borrow area and one each from the west and south drainage ditches. Sampling will not be collected if the ditches remain dry during RI activities.

Sediment samples will be collected from the same location as the surface water samples. At each of the three locations, sediment from the surface will be collected for the sample. The water and soil samples will be submitted for full HSL analyses. These sites will be sampled once, concurrent with the third round of well sampling. If conditions are such that this sampling becomes unnecessary, the Project Team will recommend that this activity not be conducted.

6.7 List of Parameters for Analysis

Analytical parameters for all samples from proposed monitoring wells, surface water, and sediment sampling sites shall include those contained in EPA's Hazardous Substance List (HSL). HSL analyses will be performed in accordance with EPA's Contract Laboratory Program (CLP) procedures by Compu-Chem Laboratories, Inc., a CLP laboratory. Certain water quality parameters (geochemical control parameters) are also proposed for analysis in order to help characterize the geochemistry of the ground water in the vicinity of the Kummer Landfill. These parameters include, but are not limited to, pH, alkalinity, dissolved oxygen, various nitrogen compounds (TKN, nitrate, nitrite, ammonia), carbon dioxide, redox potential, and some common inorganics (Ca, Mg, Na, Fe, Mn). Other parameters may be substituted or added depending on additional data developed during the RI. Ground water sample preservation and handling will be performed according to <u>Procedures for Ground Water Monitoring: Minnesota Pollution Control Agency Guidelines</u>, July, 1983 (including December 1983 Amendments). Full HSL scans are proposed at this time for Round 1 analyses. The level of analyses of Rounds 2 and 3 will be contingent on earlier analyses. The intent will be to limit subsequent analyses to those HSL fractions in which contaminants were already found to be present. Table A-7, in the Payment Schedule, details the number of samples, their associated analytical procedures, and costs.

Following receipt of results from Round 1, the data will be evaluated along with the stratigraphic data generated during the soil monitoring. An analytical program for Round 2 will then be developed. Following receipt and review of Round 2 data, a Round 3 program will be developed in the same manner.

Following design of the Round 2 and 3 sampling and analytical programs, the Project Team will develop budgets for those activities. The proposed sampling and analytical budgets will be submitted to MPCA for review and approval. Justification for selecting certain wells for sampling and for the HSL fractions to be analyzed in each sample will be provided along with the budget. Sampling and analytical methodologies will be the same as those in Round 1 and will also be consistent with the QAPP.

Following evaluation of analytical data generated from the three rounds of sampling, the Project Team may find it necessary to recommend that additional sampling be conducted. This may involve resampling all or a portion of the 22 monitoring wells. The need for conducting additional sampling surveys will be discussed with MPCA project personnel prior to being recommended.

6.8 Data Validation

Validation of the data generated in the RI will be performed in terms of its accuracy, precision, sensitivity, comparability, and completeness for meeting the objectives of the RI as defined in the QAPP. Various scientific methods of data validation including statistical analysis and evaluation of geochemical control parameters will be used in the data validation process.

6.9 Format of Data

Based on a recommendation from the MPCA, the Project Team will not prepare a Minnesota Land Management Information Center (LMIC) format package for the data generated in the RI. Should the MPCA decide at a later time to require a presentation of the data in this format, the Project Team will then propose a budget for this work.

6.10 Contamination Assessment

The Project Team will perform a contamination assessment to determine the severity of hazards at and around the site and the transport mechanism under which migration from the site is presently occurring or may be allowed to occur. This assessment will be based on background information and data generated during RI field activities. A determination of whether or not remedial action is required based on the type and quantity of wastes present and if there is a significant potential for migration of the waste at a rate requiring remedial action or further study will be included in the assessment.

6.11 Public Health Assessment

An assessment of actual and potential risks posed to public health will be conducted after completion of RI field activities. It is acknowledged that an Endangerment Assessment, dated April 1985, for this site was developed by the Minnesota Department of Health (MDH). The MDH Assessment will be considered in the preparation of the Public Health Assessment.

Findings of the RI Contamination Assessment will be used to develop the RI Public Health Assessment. In particular, these findings will include the type of contaminants released from the site and their environmental fate.

The Public Health Assessment will address the type and concentrations of contaminants detected in the aquifer which have been released from the site, the ultimate fate of the contaminants migrating from the site, the points of human contact with the contaminants and the type and severity of health risks posed by such contact. Comparisons will be made to the State of Minnesota drinking water standards.

6.12 Environmental Assessment

The Project Team will perform an Environmental Assessment to evaluate the impact of contaminants found in the aquifer on the local environment. This assessment will be performed in conjunction with the two assessments mentioned above upon completion of RI activities. The Environmental Assessment will identify the chemicals present in the aquifer, the concentrations and exposure levels of the contaminants, and the methods and significance of environmental exposure.

6.13 Remedial Investigation Draft Report

The RI Draft Report will be prepared at the conclusion of the Remedial Investigation and will be based on data generated during the initial phase of the investigation. It will include reduced data for analytical results, test borings, and logs, and other field and laboratory results. The draft report will also include detailed descriptions of the types of hazardous substances, pollutants, or contaminants found at the site; any medium (e.g., ground water, surface water, soils, air) affected by the hazardous substances, pollutants or contaminants at the site; the pathways (e.g., leachate, multi-aquifer wells, runoff) by which hazardous substances, pollutants, or contaminants reached the media; and, the extent and magnitude of hazardous substances, pollutants or contaminants in the ground water beneath and around the site. The data will be presented on cross sections, isopleth maps, graphs, tables and in narrative form.

The Contamination Assessment, Public Health Assessment and Environmental Assessments described above in Sections 6.10, 6.11 and 6.12 will also be presented in the RI Draft Report.

Included in the RI Draft Report will be a list of possible alternative response actions identified in Chapter 1-Evaluation Report as approved or modified with discussions designed for further refining and evaluation of the list if the RI has produced sufficient information to allow for a detailed analysis of those alternatives.

6.14 Amendment to the Approved RI/FS Work Plan

The Project Team will review the approved Work Plan and evaluate the need for amendments. If amendments are necessary to enable the Project Team to perform the Feasibility Study, a request for a modification of the approved Work Plan will be submitted by the Project Team. Such amendments may include pumping tests, computer modelling, additional borings and well installations, or sampling.

6.15 Remedial Investigation Final Report

Following MPCA review and comments on the RI Draft Report, the Project Team will prepare a Remedial Investigation Final Report incorporating the Agency's comments. It will be submitted in accordance with the RI/FS time schedule.

6.16 Feasibility Study

Following notification of approval of the RI Final Report by the MPCA, the Project Team will proceed with the FS. The FS will be initiated within 10 working days from the Notice To Proceed. The state shall include in the Notice To Proceed a list of possible alternatives to be evaluated in the Alternatives Report.

The purpose of the FS is to provide a detailed evaluation of the feasibility and effectiveness of implementing alternative Response Actions at the site. The FS shall be conducted in accordance with the National Oil and Hazardous Substance Contingency Plan, 40 CFR, Section 300.68(f.), (g.), and (i.), subsequent amendments and the approved or amended RI/FS Work Plan. The FS shall contain sufficient information and analyses for the State to make a determination of the appropriate extent of remedy, as specified in 40 CFR Section 300.68(j.).

6.16.1 Alternatives Report

The Alternatives Report will provide an evaluation of each of the possible alternative response actions identified in the Notice To Proceed. The purpose of preparing an Alternatives Report is to provide sufficient information on each of the possible alternative response actions which are clearly feasible or effective. (The alternative response actions to be evaluated in the Alternatives Report and the Detailed Analysis Report are referred to below as the "Evaluated Alternatives".)

For each evaluated alternative, the following will be addressed and presented in the Alternatives Report:

- Preliminary Cost Estimate: A preliminary estimate of the capital, operation and maintenance costs associated with installing or implementing each evaluated alternative.

- Environmental Effects: A general discussion of the expected adverse effects which each evaluated alternative may have on the environment.

- Effectiveness: A preliminary analysis as to whether or not each evaluated alternative is likely to effectively abate or minimize the release or threatened release of contaminants and/or minimize the threat of harm to the public health, welfare and the environment.

- Technical Feasibility and Implementability: A preliminary analysis of the technical feasibility and implementability of each evaluated alternative both in relation to the location and conditions of the release or threatened release and in relation to the reliability of the technologies which could be employed to implement the evaluated alternative.

- Identification of Technologies: An explanation of the various technologies which may be employed to implement each of the evaluated alternatives and a summary of the effectiveness, reliability, past success and availability of each specified technology.

- Recommendations: Included in the Alternatives Report will be the project team's recommendation and rationale regarding which evaluated alternatives should not be given further consideration for implementation at the site. The project team will base its recommendation on the extent to which each of the evaluated alternatives meets each of the three response action objectives and four criteria set forth in Section 8.1.2., Task 24 of the contract.

6.16.2 Review of Evaluated Alternatives (Initial Screening of Alternatives)

The purpose of implementing any response action at the site is to meet the following objectives: 1) to protect the public health, welfare and the environment; 2) to meet the requirements of Section 300.68 of the National Oil and Hazardous Substances Contingency Plan; and 3) to meet the requirements of any other applicable or relevant federal or state laws.

In preparing recommendations to the MPCA on whether or not to reject an evaluated alternative, the Project Team will consider the extent to which each of the evaluated alternatives meet each of the objectives stated above using the following criteria:

- Cost: Evaluated alternatives whose estimated costs far exceed those of other evaluated alternatives in relation to the benefits which the evaluated alternatives will produce will be eliminated.

- Environmental Effects: Evaluated alternatives that inherently present significant adverse environmental effects will be excluded from further consideration.

- Effectiveness: Evaluated alternatives that do not satisfy the response action objectives and do not contribute significantly to the protection of public health, welfare or the environment will be rejected. On-site hazardous substance control alternatives must achieve adequate control of the hazardous substances in terms of abating or minimizing the release or threatened release. Off-site alternatives must minimize or mitigate the threat of harm to public health, welfare or the environment, or they will be excluded from further consideration.

- Technical Feasibility and Implementability: Evaluated alternatives that may prove extremely difficult to implement, or that rely on unproven technologies will generally be excluded from further consideration. Evaluated alternatives that are not reliable will be excluded from further consideration.

6.16.3 Draft Detailed Analysis Report

The Project Team will prepare and submit a draft Detailed Analysis Report to the MPCA on all the evaluated alternatives that have not been previously rejected by the MPCA. The draft Detailed Analysis Report shall present the following elements for remaining evaluated alternatives.

6.16.3.1 Detailed Description

At a minimum, a detailed description will include for each remaining evaluated alternative:

- A description of the appropriate treatment and disposal technology for each remaining evaluated alternative

- A description of the special engineering considerations required to implement each remaining evaluated alternative (e.g., for a pilot treatment facility, any additional studies that may be needed to proceed with final response action design)

- A description of operation, maintenance, and monitoring requirements for each remaining evaluated alternative
- A description of off-site disposal needs and transportation plans and permits needed for each remaining evaluated alternative
- A description of temporary storage requirements and permits needed for each remaining evaluated alternative
- A description of safety requirements associated with implementing each remaining evaluated alternative, including both on-site and off-site health and safety considerations
- A description of how any of the remaining evaluated alternatives could be combined with this evaluated alternative and how any of the combinations could best be implemented to produce significant environmental improvements or cost savings
- A description/review of on-site or off-site treatment or disposal facilities for each remaining evaluated alternative which could be utilized to ensure compliance with applicable requirements of the Resource Conservation and Recovery Act, the MPCA hazardous waste rules, and the U.S. and Minnesota Department of Transportation rules

6.16.3.2 Environmental Assessment

At a minimum, an environmental assessment will include an evaluation of the environmental effects, an analysis of measures to mitigate the adverse effects, the physical or regulatory constraints, and compliance with federal and state regulatory requirements for each remaining evaluated alternative.

Each remaining evaluated alternative will be assessed in terms of the extent to which it will mitigate damage to, or protect public health, welfare and the environment, in comparison to the other remaining evaluated alternatives.

6.16.3.3 Cost Analysis

A cost analysis will include a detailed breakdown of the present value capital costs and annualized capital costs of implementing each remaining evaluated alternative (and each phase of each remaining evaluated alternative) as well as the present value, annual operating and maintenance costs. The costs will be presented as both a total cost and an equivalent annual cost.

6.16.3.4 Risk Assessment

The project team will conduct a risk assessment on human health for each remaining alternative. The risk assessment should develop, as reasonably as possible, the data that are necessary to determine the duration and residual levels of hazardous substances to which the affected population will be exposed after implementation of each remaining alternative.

6.16.3.5 Recommended Evaluated Alternative(s) and Conceptual Design

Included in the Detailed Analysis Report will be the Project Team's recommendation for which remaining evaluated alternative (or combination of remaining evaluated alternatives) should be installed or implemented at the site.

The Project Team will include a conceptual design for the recommended evaluated alternative (or combination) in the Detailed Analysis Report. The purpose of preparing a conceptual design is to illustrate all aspects of the recommended evaluated alternative (or combination) in sufficient detail to enable the MPCA to fully evaluate the recommended evaluated alternative (or combination). The conceptual design for the recommended evaluated alternative (or combination) shall include, but not be limited to, the elements listed below.

- A plan view drawing of the overall site, showing general locations for project actions and facilities

- Layouts (plan and cross sectional views, where required) for the individual facilities, other items to be installed, or actions to be implemented

- Design criteria and rationale

- A description of types of equipment required, including approximate capacity, size and materials of construction

- Process flow sheets, including chemical consumption estimates and a description of the process

- An operational description of process units or other facilities

- A description of unique structural concepts for facilities

- A description of potential construction problems

- A discussion of operating and maintenance requirements
- Right-of-way requirements

- A description of technical requirements for environmental mitigation measures

- Additional engineering data required to proceed with design

- A discussion of permits that are required pursuant to environmental and other statutes, rules and regulations

- Order-of-Magnitude implementation cost estimate

- Order-of-Magnitude annual operation and maintenance cost estimates

- Estimated implementation schedule

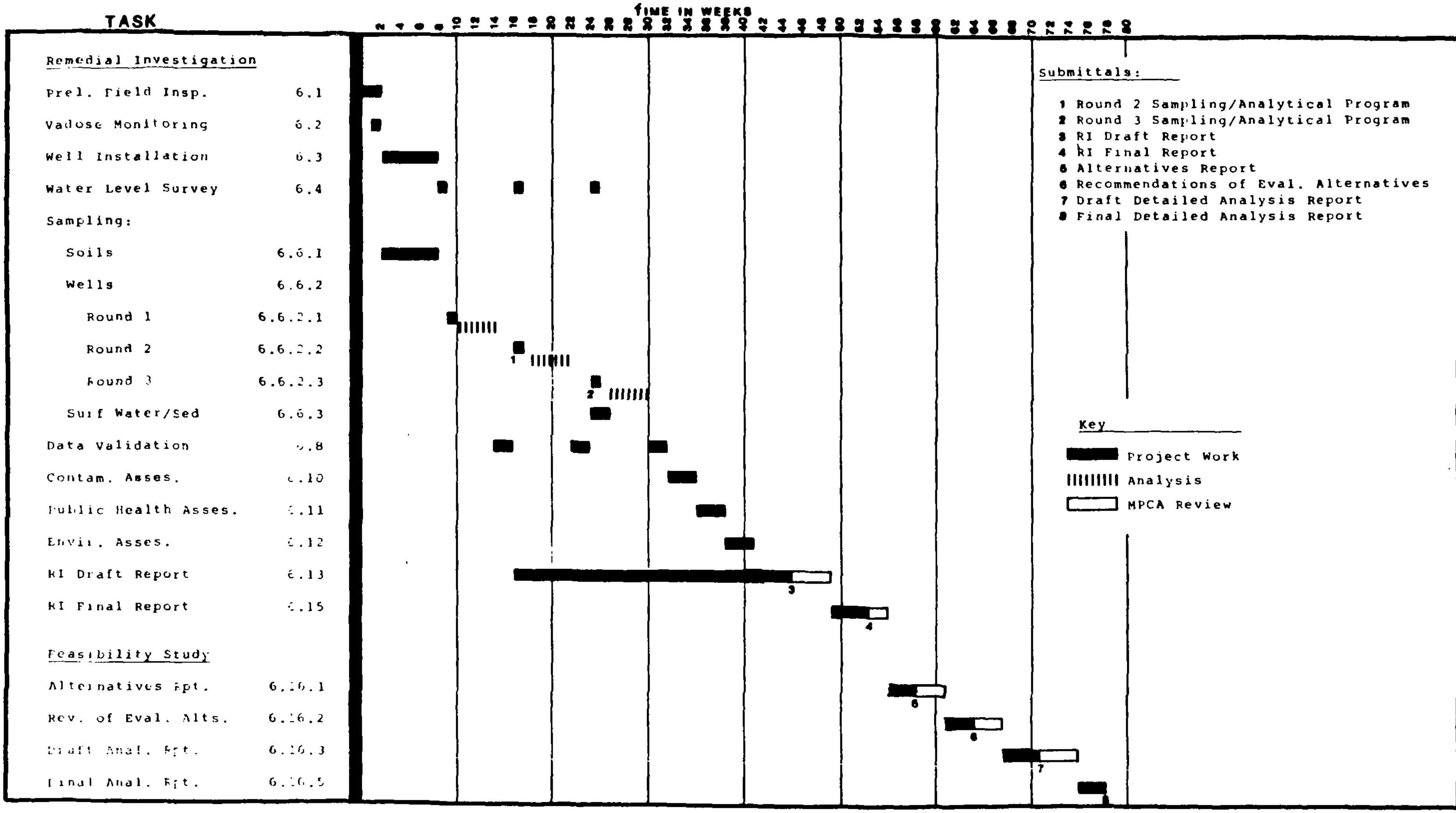
6.16.4 Approval of the Draft Detailed Analysis Report

If the MPCA substantially concurs with the Draft Detailed Analysis Report but has submitted comments, the Project Team will make the necessary modifications and submit the Final Detailed Analysis Report.

6.16.5 Final Detailed Analysis Report

The project team will prepare the Final Detailed Analysis Report incorporating MPCA comments.

KUMMER SANITARY LANDFILL
RI/FS TIME SCHEDULE



FIGURE

PAYMENT SCHEDULE

Proposed costs for performing the tasks outlined in Sections 6.1 through 6.16 of Chapter 6 are developed in the following tables:

- Table A-1: Labor Rates Per Hour (1 page)
- Table A-2: Level of Staffing and Key Individuals (3 pages)
- Table A-3: Total Labor Cost per Subsection (3 pages)
- Table A-4: Expenses (3 pages)
- Table A-5: Summary of Expenses (2 pages)
- Table A-6: Summary of Costs (2 pages)
- Table A-7: Analytical Costs (3 pages)
- Table A-8: Drilling Costs (3 pages)

Table A-1 indicates the chargeable hourly rates for Key Personnel identified in Table A-2. The rates are developed using the indirect cost and profit rates included in the Multi-Site Contract. The number of man-hours required to complete the activities in each subsection are given in Table A-2. Remedial Investigation activities are listed in Subsections 6.1 through 6.15; while those of the Feasibility Study are given in Subsections 6.16.1 through 6.16.5. It is noted that estimations of time required to perform various tasks of the Feasibility Study are heavily dependent upon results generated during the Remedial Investigation. The hours given in Subsections 6.16.1 through 6.16.5, while presently thought to be reasonable, are subject to modification as the RI progresses and the magnitude of the problem associated with the Kummer Landfill is thoroughly understood.

Labor costs indicated in the subsections of Table A-3 result from multiplying the number of hours designated for each person by his chargeable hourly rate. Labor costs for each Subsection are summed at the bottom of the table.

Expenses are itemized in Table A-4 for both the Prime Contractor and Subcontractors. Table A-5 provides separate summaries of expense costs for the Remedial Investigation and the Feasibility Study. Again, expenses for the Feasibility Study are considered reasonable at this time but are subject to revision. A more accurate cost estimate for conducting this work will depend on more detailed information regarding the exact nature and extent of contamination present at the Kummer site.

Summaries of all costs are also given separately for the Remedial Investigation and the Feasibility Study in Table A-6. This table includes Prime Contractor and Subcontractor labor and expense costs. Analytical and drilling costs are detailed further in Tables A-7 and A-8, respectively.

A range of analytical costs in Table A-7 is developed for the three proposed sampling rounds. The analytical program for Round 1 is fairly straight-forward and estimated analytical costs are given accordingly. As indicated in Sections 6.6 and 6.7 of Chapter 6, though, the level of analyses for Rounds 2 and 3 are dependent on analytical results of earlier sampling. Therefore, the cases given for Rounds 2 and 3 were developed to approximate a minimal, an approximate median, and a maximum level of analyses which may be required. The scope of analyses are given for each case along with unit costs. The analytical cost which appears in Tables A-4 and A-5 is based on using Round 1 costs and the median costs from Rounds 2 and 3.

Following development of the drilling program, cost estimates were requested from three area drilling contractors. Drilling specifications for the work were given to each of the contractors as well as to MPCA. The cost estimates included in Table A-8 are the lowest overall costs returned. The Project Team recommends that Stevens Well Drilling Company perform the work for its costs given in Table A-8. This company has already been approved by MPCA to perform drilling work as part of the Malcolm Pirnie Project Team. It is noted that the cost estimates in Table A-8 are based on the conditions and assumptions detailed in Section 6.3 of Chapter 6. A contingency fund of 15% of the total drilling cost estimate ($63,562) is recommended in the event that unforeseen circumstances arise. The contingency amount totals $9,500.

TABLE A-1

LABOR RATES PER HOUR

Labor Category	Dir. Labor Rate	Ind. Cost Factor	Ind. Labor Rate	Prof. %	Prof.	Ch'ble Hourly Rate
Contractor - MPI						
Project Officer	$40.00	1.55	$62.00	0.15	$15.30	$117.30
Project Manager	29.15	1.55	45.18	0.15	11.15	85.48
Project Engineer 1	20.17	1.55	31.26	0.15	7.72	59.15
Project Engineer 2	22.00	1.55	34.10	0.15	8.42	64.52
Project Sci'tst 1	33.00	1.55	51.15	0.15	12.62	96.77
Project Sci'tst 2	32.00	1.55	49.60	0.15	12.24	93.84
Scientist 1	20.50	1.55	31.78	0.15	7.84	60.12
Scientist 2	13.75	1.55	21.31	0.15	5.26	40.32
Other Tech. Pers'l	15.00	1.55	23.25	0.15	5.74	43.99
Word Processing	9.93	1.55	15.39	0.15	3.80	29.12
Subcontractor - LBG						
Principal	$30.10	1.78	$53.58	0.15	$12.55	$96.23
Associate	24.95	1.78	44.41	0.15	10.40	79.77
Sr Hydr	21.60	1.78	38.45	0.15	9.01	69.06
Hydr 1	16.72	1.78	29.76	0.15	6.97	53.45
Hydr 2	16.72	1.78	29.76	0.15	6.97	53.45
Technician	7.71	1.78	13.72	0.15	3.22	24.65
Word Processing	14.40	1.78	25.63	0.15	6.00	46.04
Other		1.78	0.00	0.15	0.00	0.00
Other		1.78	0.00	0.15	0.00	0.00
Subcontractor - Martinez						
Manager	$16.83	1.90	$31.98	0.15	$7.32	$56.13
Photo Engineer	12.00	1.90	22.80	0.15	5.22	40.02
Stereo Compiler	10.75	1.90	20.43	0.15	4.68	35.85
Engineer Tech 1	11.00	1.90	20.90	0.15	4.78	36.68
Engineer Tech 2	9.00	1.90	17.10	0.15	3.92	30.02
Engineer Tech 3	7.50	1.90	14.25	0.15	3.26	25.01
Subcontractor - PACE						
Manager			0.00		0.00	$65.00
Sr Technician			0.00		0.00	34.00
Jr Technician			0.00		0.00	0.00
Other			0.00		0.00	0.00

TABLE A-2

LEVEL OF STAFFING AND KEY PERSONNEL

	Key Personnel	Hours Required in Chapter 6 Subsections 6.1	6.2	6.3	6.4	6.6.1	6.6.2
Prime Contractor - MPI							
Proj Off.	Henningson	10	0	4	1	2	4
Proj Mgr.	Ritter	14	2	20	1	8	12
Proj Engr 1	Cangialosi	20	6	80	20	40	60
Proj Engr 2	Zambrella	0	0	0	0	0	0
Proj Sci 1	Woodhouse	0	4	20	0	6	0
Proj Sci 2	Krishnaswami	0	0	0	0	0	0
Sci'tst 1	Smiriglio	0	0	0	0	0	0
Sci'tst 2	Clarke	0	0	0	0	0	16
OTP	--	0	0	0	0	0	0
Word Proc	LeMay	4	2	12	6	8	16
Subtotal Prime Hours		48	14	136	28	64	108
Subcontractor - LBG							
Principal	Burke	7	0	8	0	0	0
Associate	Lamonica	0	2	0	0	0	0
Sr Hydr.	Pennino	70	6	82	1	8	45
Hydr 1	Lapham	17	40	341	6	4	0
Hydr 2	Kennedy	22	4	22	5	0	20
Technician	Nyhoff	10	0	0	0	0	0
Word Proc.	LeMay	10	2	16	2	2	16
Subcontractor - Mar							
Manager				2			
Photo Eng.				2			
St Comp.				2			
Eng Tech 1				36			
Eng Tech 2				28			
Eng Tech 3				28			
Subcontractor - PACE							
Manager							6
Sr Tech.							150
Jr Tech.							0
Subt'l Sub Hours This Page		136	54	567	14	14	237
Total Hours This Page		184	68	703	42	78	345

TABLE A-2

LEVEL OF STAFFING

Continued

	Hours required in Chapter 6 Subsections						
	6.6.3	6.7	6.8	6.9	6.10	6.11	6.12
Prime Contractor - MPI							
Proj Off.	0	2	2	0	2	2	4
Proj Mgr.	1	4	6	0	8	4	8
Proj Engr 1	8	16	10	0	32	6	6
Proj Engr 2	0	0	0	0	0	40	40
Proj Sci 1	0	0	0	0	8	0	0
Proj Sci 2	0	0	0	0	0	10	10
Sci'tst 1	0	0	0	0	0	0	0
Sci'tst 2	4	16	88	0	0	40	40
DTP	0	0	0	0	0	0	0
Word Proc	3	6	16	0	12	10	10
Subtotal Prime Hours	16	44	122	0	62	112	118
Subcontractor - LBG							
Principal	0	0	0	0	5	1	1
Associate	0	0	0	0	10	10	10
Sr Hydr.	2	5	5	0	70	20	20
Hydr 1	4	0	0	0	50	0	0
Hydr 2	1	0	0	0	45	0	0
Technician	0	0	0	0	60	0	0
Word Proc.	1	0	10	0	50	10	10
Subcontractor - Mar							
Manager							
Photo Eng							
St Comp							
Eng Tech 1							
Eng Tech 2							
Eng Tech 3							
Subcontractor - PACE							
Manager							
Sr Tech.							
Jr Tech.							
Subt'l Sub Hours, This Page	8	5	15	0	290	41	41
Total Hours This Page	24	49	137	0	352	153	159

TABLE A-2

LEVEL OF STAFFING

Continued

FS

	Hours required in Chapter 6 Subsections						
	6.13	6.14	6.15	6.16.1	6.16.2	6.16.3	6.16.5
Prime Contractor - MPI							
Proj Off.	12	3	4	3	5	10	4
Proj Mgr.	20	6	8	8	12	20	12
Proj Engr 1	64	16	30	48	64	88	40
Proj Engr 2	0	0	0	12	30	40	0
Proj Sci 1	16	0	4	0	0	10	0
Proj Sci 2	16	0	4	6	10	10	0
Sci'tst 1	0	0	0	0	10	0	0
Sci'tst 2	24	0	10	10	0	0	0
DTP	140	0	20	20	0	20	0
Word Proc	40	4	16	20	30	40	20
Subtotal Prime Hours	332	29	96	127	161	238	76
Subcontractor - LBG							
Principal	30	8	20	8	8	8	8
Associate	20	3	8	8	8	8	8
Sr Hydr.	130	65	75	25	25	25	25
Hydr 1	30	0	20	0	0	0	0
Hydr 2	16	0	15	0	0	0	0
Technician	10	0	0	0	0	0	0
Word Proc.	50	15	25	2	2	2	2
Subcontractor - Mar							
Manager							
Photo Engr.							
St Comp.							
Eng Tech 1							
Eng Tech 2							
Eng Tech 3							
Subcontractor - PACE							
Manager							
Sr Tech.							
Jr Tech.							
Subt'l Sub Hours, This Page	286	91	163	43	43	43	43
Total Hours This Page	618	120	259	170	204	281	119

TABLE A-3

TOTAL LABOR COST PER SUBSECTION

	Subsections of Chapter 6					
Category	6.1	6.2	6.3	6.4	6.6.1	6.6.2
Prime Contractor - MPI						
Proj Off.	$1,173	$0	$469	$117	$235	$469
Proj Mgr.	1197	171	1710	85	684	1026
Proj Engr 1	1183	355	4732	1183	2366	3549
Proj Engr 2	0	0	0	0	0	0
Proj Sci 1	0	387	1935	0	581	0
Proj Sci 2	0	0	0	0	0	0
Sci'tst 1	0	0	0	0	0	0
Sci'tst 2	0	0	0	0	0	645
OTP	0	0	0	0	0	0
Word Proc	116	58	349	175	233	466
Subt'l Cont.	3669	971	9196	1560	4098	6155
Subcontractor - LBG						
Principal	$674	$0	$770	$0	$0	$0
Associate	0	160	0	0	0	0
Sr Hydr.	4834	414	5663	69	552	3107
Hydr 1	909	2138	18228	321	214	0
Hydr 2	1176	214	1176	267	0	1069
Technician	246	0	0	0	0	0
Word Proc.	460	92	737	92	92	737
Subcontractor - Mar.						
Manager			$112			
Photo Eng.			80			
Ster.Comp.			72			
Eng Tech 1			1321			
Eng Tech 2			840			
Eng Tech 3			700			
Subcontractor - PACE						
Manager						$390
Sr Tech.						5100
Jr Tech.						0
Subt'l Subs	8299	3018	29698	749	858	10403
Total Costs This Page	11968	3989	38894	2310	4956	16558

TABLE A-3

TOTAL LABOR COST PER SUBSECTION

Continued

Category	6.6.3	6.7	6.8	6.9	6.10	6.11	6.12
	Subsections of Chapter 6						
Prime Contractor - MPI							
Proj Off.	$0	$235	$235	$0	$235	$235	$469
Proj Mgr.	85	342	513	0	684	342	684
Proj Engr	473	946	0	0	1893	355	355
Proj Engr	0	0	0	0	0	2581	2581
Proj Sci 1	0	0	0	0	774	0	0
Proj Sci 2	0	0	0	0	0	938	938
Sci'tst 1	0	0	0	0	0	0	0
Sci'tst 2	161	645	3548	0	0	1613	1613
DTP	0	0	0	0	0	0	0
Word Proc	87	175	466	0	349	291	291
Subt'l Cont	807	2343	4762	0	3935	6354	6931
Subcontractor - LBG							
Principal	$0	$0	$0	$0	$481	$96	$96
Associate	0	0	0	0	798	798	798
Sr Hydr.	138	345	345	0	4834	1381	1381
Hydr 1	214	0	0	0	2673	0	0
Hydr 2	53	0	0	0	2405	0	0
Technician	0	0	0	0	1479	0	0
Word Proc.	46	0	460	0	2302	460	460
Subcontractor - Mar.							
Manager							
Photo Eng							
St Comp							
Eng Tech 1							
Eng Tech 2							
Eng Tech 3							
Subcontractor - PACE							
Manager							
Sr Tech.							
Jr Tech.							
Subt'l Subs	451	345	806	0	14972	2735	2735
Total Costs This Page	1259	2688	5567	0	18906	9090	9666

TABLE A-3

TOTAL LABOR COST PER SUBSECTION

Continued

	Subsections of Chapter 6						
Category	6.13	6.14	6.15	6.16.1	6.16.2	6.16.3	6.16.5
Prime Contractor - MPI							
Proj Off.	$1,408	$352	$469	$352	$587	$1,173	$469
Proj Mgr.	1710	513	684	684	1026	1710	1026
Proj Engr	3786	946	1774	2839	3786	5205	2366
Proj Engr	0	0	0	774	1935	2581	0
Proj Sci 1	1548	0	387	0	0	968	0
Proj Sci 2	1501	0	375	563	938	938	0
Sci'tst 1	0	0	0	0	601	0	0
Sci'tst 2	968	0	403	403	0	0	0
DTP	6158	0	880	880	0	880	0
Word Proc	1165	116	466	582	874	1165	582
Subt'l Cont	18243	1928	5439	7077	9746	14619	4443
Subcontractor - LBG							
Principal	$2,887	$770	$1,925	$770	$770	$770	$770
Associate	1595	239	638	638	638	638	638
Sr Hydr.	8977	4489	5179	1726	1726	1726	1726
Hydr 1	1604	0	1069	0	0	0	0
Hydr 2	855	0	802	0	0	0	0
Technician	246	0	0	0	0	0	0
Word Proc.	2302	691	1151	92	92	92	92
Subcontractor - Mar.							
Manager							
Photo Eng							
St Comp							
Eng Tech 1							
Eng Tech 2							
Eng Tech 3							
Subcontractor - PACE							
Manager							
Sr Tech.							
Jr Tech.							
Subt'l Subs	18467	6188	10764	3226	3226	3226	3226
Total Costs This Page	36710	8116	16203	10304	12973	17845	7670

TABLE A-4

EXPENSES

"P" is for Prime "S" is for Subs

ITEM DESCRIPTION		Subsections of Chapter 6: 6.1	6.2	6.3	6.4	6.6.1	6.6.2	Total This Page
Travel & Subsistence								
Airfare, $	P:	660		450			330	1440
	S:	480	120	360			120	1080
Auto Rent, days	P:	2	1	8		12	4	27
	S:	4	0	3		0	2	9
Mileage, miles	P:	100	25	25		100	100	350
	S:	550	50	2385		25	1000	4010
Meals, days	P:	2	1	3			4	10
	S:	10	1	49		1	17	78
Lodging, days	P:	1	1	4		4	4	14
	S:	6	1	45			17	69
Other - 1	P:							0
	S:							0
Other - 2	P:							0
	S:							0
Equipment, Materials, Supplies, and Services								
Telephone, $	P:	85	100	125	25	75	85	495
	S:	30	75	200		20	75	400
Prints/Mylars, $	P:							0
	S:	10	10	55				75
Comm.Printing, $	P:							0
	S:	20	25	60				105
Postage, $	P:	40	40	75	20	40	40	255
	S:	20	40	65		30	10	165
Equipment, $	P:		200			75		275
	S:	150	500	1328	60	50	1345	3433
Shipping, $	P:							0
	S:	50	400	205		150	0	805
Photocopies, #	P:	500	500	500		250	500	2250
	S:	250	250	300		250	0	1050
Drilling, $	P:							0
	S:			73062 (See Table A-8)				73062
Analyses, $	P:							0
	S:							0
Computer, $	P:							0
	S:	60		225	30		150	465
Other - 3	P:							0
	S:							0

TABLE A-4

EXPENSES

Continued

"P" is for Prime "S" is for Subs

ITEM DESCRIPTION		6.6.3	6.7	6.8	6.9	6.10	6.11	6.12	Total This Page
		Subsections of Chapter 6							
Travel & Subsistence									
Airfare, $	P:					330			330
	S:								0
Auto Rent, days	P:					4			4
	S:								0
Mileage, miles	P:	25	30	25	25	25	25	25	180
	S:	20							20
Meals, days	P:					4			4
	S:	1							1
Lodging, days	P:					3			3
	S:								0
Other - 1	P:								0
	S:								0
Other - 2	P:								0
	S:								0
Equipment, Materials, Supplies, and Services									
Telephone, $	P:	50	100	125	25	75	75	75	525
	S:	15		75	25	150	25	25	315
Prints/Mylars, $	P:							30	30
	S:			50		50			100
Comm.Printing, $	P:							50	50
	S:			50		100			150
Postage, $	P:	50	50	50		50	50	50	300
	S:			30		50	25	20	125
Equipment, $	P:								0
	S:	50							50
Shipping, $	P:								0
	S:		3910						3910
Photocopies, #	P:	300	200	1500		500	500	500	3500
	S:			100		500	200	200	1000
Drilling, $	P:								0
	S:								0
Analyses, $	P:								0
	S:		62638 (See Paym't Sch. and Table A-7)						62638
Computer, $	P:			250					250
	S:	15	150	50		100	50	50	415
Other - 3	P:								0
	S:								0

TABLE A-4

EXPENSES

Continued

"P" is for Prime "S" is for Subs

ITEM DESCRIPTION		Subsections of Chapter 6: 6.13	6.14	6.15	6.16.1	6.16.2	6.16.3	6.16.5	Total This Page
Travel & Subsistence									
Airfare, $	P:	660					660		1320
	S:								0
Auto Rent, days	P:	4					4		8
	S:								0
Mileage, miles	P:	100	25	100	25	25	100	25	400
	S:		40	40	60	20	40	20	220
Meals, days	P:	6		6			4		16
	S:								0
Lodging, days	P:	6					4		10
	S:								0
Other - 1	P:								0
	S:								0
Other - 2	P:								0
	S:								0
Equipment, Materials, Supplies, and Services									
Telephone, $	P:	100	75	75	85	85	85	85	590
	S:	150	50	50	50	50	25	50	425
Prints/Mylars, $	P:	30					30	30	90
	S:	100	20	20	25		20	20	205
Comm. Printing, $	P:			50				50	100
	S:	75	25	20	20	20	20	20	200
Postage, $	P:	45	100	50	50	75	30	75	425
	S:	100	30	30	30		30	30	250
Equipment, $	P:								0
	S:								0
Shipping, $	P:								0
	S:								0
Photocopies, #	P:	100	2000	500	500	2000	100	2000	7200
	S:	500	500	500	500	500	250	250	3000
Drilling, $	P:								0
	S:								0
Analyses, $	P:								0
	S:								0
Computer, $	P:								0
	S:	150	100	75	100	50	150	50	675
Other - 3	P:								0
	S:								0

Remedial Investigation Only

TABLE A-5

EXPENSES: "P" IS FOR PRIME, "S" IS FOR SUBS

Item Description	Unit Cost	Units-P	Units-S	Cost-P	Cost-S
Travel & Subsistence					
Airfare	Cost+10%			$2,673	$1,188
Auto Rental, days	$55.00	35	9	1925	495
Auto Mileage, miles	$0.27	755	4110	204	1110
Days of Meals	$25.00	26	79	650	1963
Days of Lodging	$45.00	23	69	1035	3105
Other - 1	---			0	0
Other - 2	---			0	0
Equip,Mat'ls,Supplies, Services					
Telephone	Cost+10%			1397	1062
Prints/Mylars	Cost			60	315
Comm Printing	Cost+10%			110	413
Postage	Cost+10%			825	495
Equipment	Cost			275	3483
Shipping	Cost+10%			0	5187
Photocopies	$0.10	8350	3550	835	355
Drilling	Cost			0	73062
Analyses	Cost			0	62638
Computer	Cost			250	1205
Other - 3	---			0	0
Subtotal - Prime Contractor				$10,239	
Subtotal - Subcontractors *					$156,074
Total - All Expenses for Remedial Investigation					$166,313

*Subcontractor labor costs and expenses are subject to an Administration Fee for Subcontractors of 15%

Remedial Investigation activities are Subsections 6.1 through 6.15.

Feasibility Study Only

TABLE A-5

EXPENSES: "P" IS FOR PRIME, "S" IS FOR SUBS

Item Description	Unit Cost	Units-P	Units-S	Cost-P	Cost-S
Travel & Subsistence					
Airfare	Cost+10%			$726	$0
Auto Rental, days	$55.00	4	0	220	0
Auto Mileage, miles	$0.27	1685	140	47	38
Days of Meals	$25.00	4	0	100	0
Days of Lodging	$45.00	4	0	180	0
Other - 1	---	0	0	0	0
Other - 2	---	0	0	0	0
Equip,Mat'ls,Supplies, Services					
Telephone	Cost+10%			374	193
Prints/Mylars	Cost			60	65
Comm Printing	Cost+10%			55	88
Postage	Cost+10%			253	99
Equipment	Cost			0	0
Shipping	Cost+10%			0	0
Photocopies	$0.10	4600	1500	460	150
Drilling	Cost			0	0
Analyses	Cost			0	0
Computer	Cost			0	350
Other - 3	---			0	0
Subtotal - Prime Contractor				$2,475	
Subtotal - Subcontractors *					$982
Total - All Expenses for Feasibility Study					$3,458

*Subcontractor labor costs and expenses are subject to an Administration Fee for Subcontractors of 15%

Feasibility Study activities are Subsections 6.16.1 through 6.16.5.

Remedial Investigation Only

TABLE A-6

SUMMARY OF COSTS

Subcontractor Labor Costs:	$110,489
Subcontractors' Expenses:	$156,074
Total Subcontractor Costs:	$266,562

Prime Contractor Labor:	$76,391
Prime Contractor Expenses:	$10,239
Total Subcontractor Costs:	$266,562
Admin. Fee for Subcontractors:	$39,984

Total Prime Contractor Costs Billable to State: (for Remedial Investigation)	$393,177

Feasibility Study Only

TABLE A-6

SUMMARY OF COSTS

Subcontractor Labor Costs:	$12,906
Subcontractors' Expenses:	$982
Total Subcontractor Costs:	$13,888

Prime Contractor Labor:	$35,886
Prime Contractor Expenses:	$2,475
Total Subcontractor Costs:	$13,888
Admin. Fee for Subcontractors:	$2,083
Total Prime Contractor Costs Billable to State: (for Feasibility Study)	$54,333

TABLE A-7

ANALYTICAL COSTS

Round 1:

Sample Description	Quantity	Unit Cost	Total Cost
Full HSL, GW, Clusters 1-6	14	$1575	$22,050
Full HSL, W, (QA/QC)	4	1575	6,300
WQP, GW	14	138	1,932
WQP, (QA/QC)	2	138	276
Containers/Shipping	18	85	1,530
	Subtotal.................		$32,088 *

Notes: HSL - Hazardous Substance List
GW - Ground Water
W - Water
SW - Surface Water
S/S - Soil Sediment
Vol - HSL Volatile Fraction
WQP - Water-Quality Parameters (see Section 6.7)
* - Costs for these cases were used to develop the analytical cost listed in Table A-4.

TABLE A-7

ANALYTICAL COSTS

Round 2: Case 1 - No contamination found in Cluster 1-6 wells.

Sample Description	Quantity	Unit Cost	Total Cost
Full HSL, GW, Clusters 7,8,9	8	$1575	$12,600
Full HSL, W, (QA/QC)	4	1575	6,300
WQP, GW, Cluster 7,8,9	8	138	1,104
WQP, (QA/QC)	2	138	276
Containers/Shipping	12	85	1,020
		Subtotal.....	$21,300

Round 2: Case 2 - Volatile contamination found in 10 of 14 Cluster 1-6 wells.

Sample Description	Quantity	Unit Cost	Total Cost
Full HSL, GW, Clusters 7,8,9	8	$1575	$12,600
Full HSL, W, (QA/QC)	4	1575	6,300
Vol, GW, Clusters 1-6	10	405	4,050
WQP, GW, Clusters 7,8,9	8	138	1,104
WQP, W	2	138	276
Containers/Shipping	14	85	1,190
		Subtotal.....	$25,520 *

Round 2: Case 3 - Contaminants in all HSL fractions found in all Cluster 1-6 wells.

Sample Description	Quantity	Unit Cost	Total Cost
Full HSL, GW, Clusters 7,8,9	8	$1575	$12,600
Full HSL, GW, Clusters 1-6	14	1575	22,050
Full HSL, W, (QA/QC)	6	1575	9,450
WQP, GW, Clusters 7,8,9	8	138	1,104
WQP, (QA/QC)	2	138	276
Containers/Shipping	15	85	1,275
		Subtotal.....	$46,755

Notes:
- HSL - Hazardous Substance List
- GW - Ground Water
- W - Water
- SW - Surface Water
- S/S - Soil Sediment
- Vol - HSL Volatile Fraction
- WQP - Water-Quality Parameters (see Section 6.7)
- * - Costs for these cases were used to develop the analytical cost listed in Table A-4.

TABLE A-7

ANALYTICAL COSTS

Round 3: Case 4 - No contamination found in Cluster 1-9 wells in Rounds 1 and 2.

Sample Description	Quantity	Unit Cost	Total Cost
None Required			-0-

Round 3: Case 5 - Case 2 or Case 3 plus only volatile contamination found in all Cluster 7,8,9 wells.

Sample Description	Quantity	Unit Cost	Total Cost
Vol, GW, Clusters 7,8,9	8	$ 405	$3,240
Vol, W, (QA/QC)	4	405	1,620
Containers/Shipping	2	85	170
		Subtotal........	$5,030 *

Round 3: Case 6 - Case 2 or Case 3 plus contaminants in all HSL fractions found in all Cluster 7,8,9 wells; also surface water and sediment require sampling.

Sample Description	Quantity	Unit Cost	Total Cost
Full HSL, GW, Clusters 7,8,9	8	$1575	$12,600
Full HSL, SW	3	1575	4,725
Full HSL, W, (QA/QC)	4	1575	6,300
Full HSL, S/S	3	1575	4,725
Full HSL, S/S, (QA/QC)	2	1575	3,150
WQP, SW	3	138	414
WQP, (QA/QC)	2	138	276
Containers/Shipping	16	85	1,360
		Subtotal.......	$33,550

Notes: HSL - Hazardous Substance List
GW - Ground Water
W - Water
SW - Surface Water
S/S - Soil Sediment
Vol - HSL Volatile Fraction
WQP - Water-Quality Parameters (see Section 6.7)
* - Costs for these cases were used to develop the analytical cost listed in Table A-4.

TABLE A-8

DRILLING COSTS

For Soil Borings and A and B Depth Wells:

Item	Quantity	Unit Cost	Total Cost
Borehole for 2" Casing	545 ft.	$ 7.11	$ 3,875
Split-Spoon Sampling, 0 to 40 ft. (every five feet)	69 spoons	28.11	1,940
2" SS Casing	449 ft.	8.77	3,938
2" - 5 ft. SS Screen	8 screens	197.10	1,577
2" - 10 ft. SS Screen	9 screens	330.43	2,973
Well Development	Per Hour (1hr/well)	78.09	1,328
4" - 6 ft. Protective Casing with Caps and Locks	For 17 wells	156.34	2,658
Sand, Bentonite, Grout	for 17 wells	--	2,928
Subtotal			$21,217

TABLE A-8

DRILLING COSTS

For C Depth Wells:

Item	Quantity	Unit Cost	Total Cost
Borehole for 10" Outer Casing	200 ft.	$ 10.51	$ 2,102
10" Black Iron Casing	205 ft.	5.30	1,086
Borehole for 4" Casing	100 ft.	27.32	2,732
Split-Spoon Sampling			
- Every 5 ft, 40 to 60 ft.	per spoon	56.35	- -
- Continuous, 40 to 60 ft.	50 spoons	56.35	2,817
4" SS Casing	285 ft.	16.01	4,563
4" - 5 ft. SS Screen	5 screens	299.21	1,496
Well Development	per hour (1 hr/well)	165.09	825
4" Caps and Locks	for 5 wells	73.04	365
Sand, Bentonite, Grout	for 5 wells	- -	3,624

Subtotal...$19,610

TABLE A-8

For Mobilization/Demobilization and Miscellaneous:

Item	Quantity	Unit Cost	Total Cost
Mob/Demob to Northern Township	Once	- -	$ 6,583
Mob/Demob Between Clusters	8 moves	$ 83.94	672
Mob/Demob Between Wells in Each Cluster	13 moves	55.33	719
Steam Clean Between Clusters	8 cleanings	91.51	732
Steam Clean Between Wells	19 cleanings	91.51	1,739
Authorized Stand-by Time	per hour	78.09	- -
4" Guard Posts for New Wells	66 posts	49.26	3,251
Remove Existing 1¼" Wells	5 wells	167.47	837
4"- 6 ft. Protective Casing with Caps and Locks for Existing Wells	5 wells	156.34	782
4" Guard Posts for Existing Wells	15 posts	49.26	739
Develop Existing Wells	10 wells	78.09	781
Field Office	For 1 month	100.00	100
Sanitary Facilities	For 1 month	120.00	120
Wastewater Storage and Disposal at POTW (est.)	- -	- -	4,000
Well Site Preparations	For 1 day	1,680.00	1,680

Subtotal..$22,735

TOTAL. (Sum of drilling costs - borings + A, B & C depth wells, & mob/demob)..........$63,562

21,217

19,610

Contingency Fund for Drilling. (15%)..........................$ 9,500

22,735 GRAND TOTAL..$73,062

SDMS US EPA Region V

Imagery Insert Form

Some images in this document may be illegible or unavailable in SDMS. Please see reason(s) indicated below:

☐ Illegible due to bad source documents. Image(s) in SDMS is equivalent to hard copy.

Specify Type of Document(s) / Comment

☐ **Confidential Business Information (CBI).**
This document contains highly sensitive information. Due to confidentiality, materials with such information are not available in SDMS. For questions regarding viewing this document, you may contact the EPA Superfund Records Manager.

Specify Type of Document(s) / Comment

☒ **Unscannable Material: Oversized X or __ Format.**
Due to certain scanning equipment capability limitations, the document page(s) is not available in SDMS. The original document is available for viewing at the Superfund Records center.

Specify Type of Document(s) / Comment

PLATE 1 – LOCATION OF EXISTING MONITOR WELLS

☐ **Other:**